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Sustainability Practices in Construction Project Management in the West Bank/ Palestine

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Dedication

To my parents (Mother and Father), brothers, friends and colleagues

Moutaz

Acknowledgment

First, I praise Allah for bestowing me the capability to end the requirement of the master degree in Engineering Management program successfully.

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الإقرار

أنا الموقع أدناه، مقدم الرسالة التي تحمل عنوان:

Sustainability Practices in Construction Project Management in the West Bank/ Palestine

أقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء ما تمت الاشارة اليه حيثما ورد، وأن هذه الرسالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أي درجة علمية أو بحث علمي أو بحثي لأي مؤسسة علمية أو بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: **اسم الطالب:** معتز محمد حمدونة

Signature: **التوقيع:**

Date: **التاريخ:** 2020/10/22

Table of Content

List of Tables

List of Figures

List of Abbreviations

CPM: Construction Project Management

SD: Sustainable Development

SPM: Sustainable Project Management

SCPM: Sustainable Construction Project Management

SCPMP: Sustainable Construction Project Management Performance

WCED: World Commission of Environment and Development

TBL: Triple Bottom Line

SEM: Structural Equation Modeling

PLS-SEM: Partial Least Square- Structural Equation Modeling

LEED: Leadership in Energy and Environmental Design

NFI: Normed Fit Index

CV: Convergent Validity

DV: Discriminant Validity

AVE: Average Variance Extracted

IR: Indicator Reliability

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Abstract

Sustainable Development (SD) is an emerging guidance that aims to meet current generation needs without compromising future generations to meet their own needs. Since last decades, several initiatives have been created to encourage the construction sector to support the SD agenda. This study aims to explore practices affecting sustainable performance through the construction project management (CPM) phases in the West Bank/ Palestine. Data was collected by utilizing a mixed methodology approach, quantitative data were collected by 73 completed questionnaires, and qualitative data collected through 11 semi-structured interviews with experts from the CPM field in the West Bank. Data was analyzed by thematic analysis and the Partial least square (PLS-SEM) approach. Data analysis results revealed 24 most important sustainable practices that were always implemented by engineers in each stage of the construction projects in the West Bank, which are classified as follows: 1 of the practices is classified under the inception stage, 8 practices under the design stage, 7 practices under the tendering stage, and 8 practices under implementation stage. The most common practice taken in consideration during the inception stage of the construction projects in the West Bank is including

diverse representatives from the project team functions (85.6%), and the most common practices that are taken during the design stage are: adapting standard dimensions in the design specifications (90.6%), and compliance with legal requirements (90.3%). In the tendering stage, the most taken practices are preventing bribery and corruption (94.7%), transparent procurement procedure (94.7%), and comprehensive contract and specifications documentation (92.2). Finally, the most taken practices during the implementation stage are: compliance with the required specifications and quality level (89%), and insurance for the construction site, workforces and equipment (89%). In addition, the path coefficients test revealed that sustainability practices in the inception stage had the highest positive influence on sustainable Construction Project Management Performance (SCPMP), where the path coefficient $\beta = 0.308$. More and more, the study demonstrated that the key barrier to SCPM in Palestine is lack of stakeholders' interest on sustainability issues (87.8%), therefore, it is recommended to rise sustainability awareness in the Palestinian construction sector, especially among the decision makers levels. This is the first study that draws the road map for construction institutions in West Bank by providing the SCPM framework, as a practical tool for integrating sustainability requirements in their CPM practices.

Chapter One

Introduction

1.1 Chapter Overview

This chapter presents the background on sustainability and construction industry, the research problem, objectives, questions, and a summary of thesis structure.

1.2 Background

The current global environmental degradation is a result of the increasing natural resources consumption, which exceeds what is possible to sustain in the long term, causing degradation of eco-system and human living conditions (Persson, 2009). This consumption is more likely to escalate in future; an evidence is the increasing content of carbon dioxide in the atmosphere with more than the expected rate (Raupach et al., 2007). A major threat of such pressure on natural resources is the climate change (Rummukainen and Källén, 2009). The climate change has serious consequences for the living condition, such like the rise in sea level, flooding, heavy rainfall, drought, fresh water shortage, increased extreme events, higher average temperatures and several economic, social, and health impacts (Roper, 2008). Therefore, sustainability issues become one of the most important challenges of our time and a pressing requirement (Ohelmann, 2010).

In 1987, the World Commission of Environment and Development (WCED) presented sustainability as “the ability of current generations to meet their needs without compromising the ability of future generations to meet theirs” (Nations, 1987). Furthermore, Elkington (1997) described sustainability as the balance or harmony between economic, social, and environmental sustainability, which was identified as the “Triple bottom line “(TBL), or “triple-P” (people, planet, profit) concept.

The “Sustainable Development” (SD) concept was first originated in 1980s, in addition to set of guidance measures in order to correct the market failure, decrease the consumption rate of non-renewable resources, mitigate cumulative pollution and steer the production processes into a more precautionary approach of development (Turner, 2006). The most common definition of SD is derived from the definition of sustainability, it is also presented by the WCED as the way that insures satisfying the needs of current generations without compromising the future generations to meet their own needs (Nations, 1987). Then in Rio Summit 1992, sustainable development concept was discussed more in-depth and translated into a development program for the 21st century as the Agenda 21 for sustainable development (Du Plessis, 2007).

With the rising awareness of sustainability and SD, many industrial countries developed their national SD strategies to measure their share of global depletion of resources (Atkinson, 2008). In Business, companies as a serious part of the society started to feel the need and pressure to adopt and

integrate the SD concepts in their strategies, polices and activities (Keeble and Topiol, 2003). Traditionally, project success factors were related to the compliance with scope, time, and cost objectives (De Wit, 1988). In recent years, project success factors are expanded to include more sustainability requirements, such as the project efficiency, impact on team and customers, business and direct success, and preparation for future (Silvius, 2017).

Projects can contribute to the SD agendas of organizations and society (Silvius and Schipper, 2014). "Green" or "sustainable" project management is considered as challenging global project management trends (Alvarez-Dionisi et al., 2016). Sustainability in project management is a new, distinct, and emerging school of thinking, within the past decade, it was studied and discussed by significant academic communities (Silvius, 2017). Carvalho and Racbechini (2017) recommended organizations to introduce sustainability in their project management practices, due to its pivotal role in improving project success and reducing negative economic, social and environmental impact.

Construction projects have incredible social and environmental impacts (Burgan and Sansom, 2006). It is responsible of enormous waste production, massive energy consumption, environmental pollution, resource depletion, habitat destruction, soil erosion and increasing material wastage besides the nuisance it causes to the surrounding communities (Yosef et al., 2017; Abdel-Raheem and Ramsbottom, 2016; Ijigah et al., 2013). Therefore, adapting the general sustainable development

requirements and concepts through the conventional CPM stages is an emerging field of science (Matar et al., 2008)

1.3 The Research Problem

Traditionally, the project objectives are limited to time, cost and quality, and less or neglected attention is paid for sustainability requirements (Silvius et al., 2017). In addition, economic development has been put above meeting sustainability requirements (Banihashemi et al., 2017).

The construction industry is the engine of countries development and economic growth; it plays a serious role in social-economic development, and providing employment opportunities, infrastructure, and over all urban development (Dang and Low, 2011). Supported by Khan et al. (2014), the importance of construction sector is driven by its backward and forward linkages with other several economy sectors, it is regarded as one of the highest contributors to growth.

Construction in Palestine constitutes a leading sector in economic growth, it plays a serious rule in employment, value added and urban development, and it includes a high potential demand (Sabra et al., 2015). In spite of that, several factors and challenges affect its sustainable performance. Some of these factors are related to the complicated political situation, and others are related to projects management practices, such the insufficient leadership skills, inappropriate planning, several amendments, shortage of material, lack of monitoring and feedback, lack of communication between

projects parties, and the reworks. (Enshassi et al., 2006; UNRWA 2006; Ibrahim, 2013).

Therefore, there is a serious need to manage the Palestinian construction sector in line with sustainable development goals, and identify practices affecting sustainable construction project management (SCPM). In addition to the need for a framework as a guideline that would assist practitioners in assessing and enhancing their sustainable construction management practices.

1.4 The Research Objectives

In light of the research problem, the aim of this study is to identify the key practices, barriers, and drivers affecting and contributing to the successful implementation of sustainable management performance in the Palestinian construction projects field, particularly in the West Bank. Consequently, this thesis aims at developing a conceptual framework as a guideline by which project managers in construction sector can take their first step in SCPM.

1.5 The Research Questions

The research questions are driven by the objectives of the study. As mentioned before, it aims first to explore sustainability practice for Palestinian construction management field, and second to propose a conceptual framework for project managers to assess and enhance their sustainable management performance. Thus, the research questions are:

- What are the key practices affecting successful implementation of sustainability in construction project management in the West Bank/Palestine?

- What are the key drivers and barriers affecting successful implementation of sustainability in construction project management in the West Bank/Palestine?

- What model should be adapted in the West Bank construction project companies to enhance sustainability performance of construction project?

1.6 Research Hypotheses

In order to achieve the research objectives and answer the questions, the following research hypotheses are proposed:

H1: The implementation of sustainable project inception practices has a positive effect on the Construction Project Management Performance (CPMP) in the West Bank.

H2: The implementation of sustainable project design practices has a positive effect on the CPMP in the West Bank.

H3: The implementation of sustainable project tendering practices has a positive effect on the CPMP in the West Bank.

H4: The implementation of sustainable project implementation practices has a positive effect on the CPMP in the West Bank.

H5: Explored drivers of SCPM have a positive effect on construction project management Performance in the West Bank.

1.7 Thesis Structure

This research is organized in six chapters as follows:

Chapter One, the **research introduction,** which consist of the study background, problem, objectives, and the research hypothesis.

Chapter Two, literature review, contains background on project management and CPM, sustainability and SD definitions, sustainability in project management field and in CPM process, it also includes the SCPM assessment tools found in literature, the CPM in Palestine and the thesis conceptual framework.

Chapter Three, the **research methodology**, research design, research strategy, methodology flow charts, population and sample size, data collection techniques are all presented.

Chapter Four, Data analysis. It includes the thematic analysis approach for analyzing qualitative data collected via interviewing experts and the Partial Least Squares-SEM for analyzing the quantitative data and testing hypothesis.

Chapter Five, the **results discussion and framework development**. This chapter discusses the results and findings obtained from data analysis following sustainability practices in the CPM stages, drivers and barriers to

SCPMP, then it presents the research hypothesis testing results, and finally, the study SCPM framework is illustrated in details.

Chapter Six, the **conclusion and recommendations**. It contains a summary of the research outputs, the conclusion of the data analysis findings, the research proposed recommendations, the research limitations, and the future researches suggestions.

Chapter Two
Literature Review

2.1 Overview.

This chapter consists of background on project management and CPM, sustainability and SD definitions, sustainability in project management field and in CPM process. It also included the SCPM assessment tools found in literature, the CPM in Palestine and the research conceptual framework.

2.2 Project Management Definition

Historically, and according to Kerzner (1989), the project involves a series of tasks and activities that consume resources in order to achieve a specific objective within a set of specifications and a definite start and end dates. While project management is the process for achievement of such objective, by utilizing the organizational structure and resources, and it seeks to manage the project without disturbing the routine operation of the company by applying a collection of tools and techniques.

The Project Management Institution (PMI) defined Project as “a temporary endeavor undertaken to create a unique product, service, or result “. While the process of managing the project is defined as “the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (PMBoK, 2013).

Comprehensively speaking, according to the Project Management Body of Knowledge PMBoK (2004, p. 6), effective project management is achieved through the appropriate application and integration of the project management processes, which are grouped as initiating, planning, execution, monitoring and controlling, and closing. Furthermore, the general project management process includes the identifying requirements, appreciation of stakeholders needs throughout all the project management stages, and balancing the competing project constraints, which are the scope, quality, schedule, budget, resource and risk.

2.3 Construction Project Management

Construction is the process for the developing of human settlements and infrastructures; it involves the extraction of raw materials, manufacturing of construction materials and its components, which are used throughout the project life cycle, in addition to the management and the operation of the built area (Du Plessis, 2002). This industry is one of the most essential sectors in the economy; it interacts with all fields of human endeavors (Duy Nguyen et al., 2004). It also has a critical relation with poverty reduction through the basic economic and social services provided in the built environment, in addition to provision of job opportunities, and the improvement relative to its economic, social and environmental impact (ISO, 2008). Therefore, construction has an essential role in the attainment of sustainable development of human settlements (Du Plessis, 2002), as

well as the attainment of the nation's welfare (Horvath and Hendrickson, 1998).

In spite of the importance of construction sector as driving force for nation's economy, it has serious threats that should be considered and addressed; the most significant impact is the global climate change due to enormous green gas emissions (Du Plessis, 2007). Moreover, construction deeply affects the surrounding environment and society; it changes the nature and spatial appearance (Asad et al., 2006). In addition, the resource deterioration due to the extraction, production and transportation of construction materials, and chemical pollution by releasing particles in the production and transportation of materials such as cement and quarry products, the spillage of chemicals in the site, and the careless disposal of the huge amount of wastes generated (Ramachandran, 1991; Celik et al., 2017). More and more, the increase of the external road traffic and dirtiness of construction area and surrounding environment which affect the welfare of the community (Sharrard et al., 2008).

Construction industry has a special characteristic that distinguishes it from other industries, it is fragmented, very sensitive to the economic and political environment, it also has a high rate of failures (Enshassi et al., 2006). Therefore, it needs a careful planning and a high amount of time and money (Abdel-Raheem and Ramsbottom, 2016). All that sheds the light on the pressing need for shifting the scope of construction projects management from managing the project triple constraints (time, cost and

quality), to managing social, environmental and economic impacts and adopting sustainable construction concepts (Silvius and Schipper, 2014).

2.4 The Concept of Sustainability

The concepts of sustainability and sustainable development were presented since 1987 by the world commission on Environment and Development (WCED) (Keeble et al., 2003). Sustainability was first defined as the ability of current generations to meet their needs without compromising other generations to meet their needs (Redclift, 2002). SD is a process of change through which the use of resources, the investments, technological development and organizational change, are all in accordance to the current and future needs of generations and in a way that promotes harmony between humanity and nature (Nations, 1987). In addition, Elkington (1997) defined sustainability as the balance or harmony between economic, social, and environmental sustainability, which was called the "Triple Bottom Line" (TBL), or "triple-p" (people, planet and profit) concept. According to Du Plessis (2007), sustainability is the identification and promotion of responses that will allow the continued existence of the community at the best possible quality of life. Moreover, the endeavor of sustainability according to Schultmann and Sunke (2007) is the achievement of economic growth without unreasonable exploiting of resources, pollution of environment or upsetting any existing ecosystem. In other words, it is the matter of how can we develop prosperity without compromising the future (Silvius and Schipper, 2014). As shown, there are

so many definitions of SD and sustainability in literature, but the common part in most of these definitions is the concept of satisfying the environmental, social and economic sustainability dimensions, which are referred to as the objectives or pillars of SD (Brent and Labuschagne, 2006).

Recently, sustainability has become an integrated part of planning, it considered as a significant complementary approach that provides much to the theories, objectives and goals of the planning profession and the community development (Jepson, 2001). The need for integrating sustainability concepts in the strategic planning level arose with the appearance of Agenda 21 for sustainable construction at the "1992 United Nation Conference on Environment and Development" (Sanchez and Lopez, 2010). Awareness of the environmental degradation and the need for more environmentally sound products and services are increasing throughout the globe (Cohen and Winn, 2007). Especially in project management field, with the rising universal demand for a sustainable built environment (Zhang et al., 2016).

Due to the increasing interest in more ethically, ecofriendly and economic efficiency throughout the project lifecycle (Kivila et al., 2017), sustainability has become one of the most essential challenges of our time (Silvius, 2017). Literature on sustainable practices is growing and become an attractive field of research, which argues for a significant change in systems providing human needs (Wieczorek, 2018).

2.5 Sustainable Project Management

Project management is the means by which the work of the resources assigned to the temporary organization is planned, managed and controlled to deliver the beneficial change (Turner, 2014). Project is regarded as a suitable instrument for change management, so applying the project management discipline to sustainability will promote the necessary required change (Marcelino-Sádaba et al., 2015).

With the growing attention for sustainability, it has become a significant perspective in managing firms and projects via a holistic sustainability strategy (Chang et al., 2017), and sustainability concepts has more been linked to the processes of project management (Gareis et al., 2009; Silvius et al., 2009). It also became necessary to recognize the social, environmental and economic consequences associated with how projects and it's supporting systems are designed, implemented, operated, maintained and finally eliminated (El-Haram et al., 2007).

According to Deland (2009), sustainable project management (SPM) is the reduction of resources consumption through the project, from initiation to the closing. In addition, Silvius et al. (2009) defined SPM as the change management that considers the economic, environmental and social impact of the projects and its deliverables for current and future generations. Moreover, Tan et al. (2011) presented SPM as the rising of positive economic, social and environmental impacts in the process of project

delivery in addition to reducing the negative effects in order to contribute to a sustainable society.

In addition to the social, environmental and economic dimensions of sustainability, Silvius and Schipper (2014) identified other sustainability areas of impact on project management through a review of 164 publications on SPM. The identified areas of impact are: the ‘value and ethics’ referring to considering the society culture (Robinson, 2004), the ‘geographical dimension’ by considering sustainability effects locally, regionally and globally (Gareis et al., 2009). In addition to the ‘time effect’ by considering short-term and long-term consequences (Brent and Labuschange, 2006). The ‘stakeholders’ participation’ by considering their interests (Freeman, 1994), and the ‘waste reduction’ for saving available resources (Maltzman and Shirley, 2010). Moreover, the ‘transparency’ by providing clear and periodic information for stakeholders, the ‘accountability’ refering to the organization responsibility for its policies, decisions and actions (ISO, 2010), and the ‘risk reduction’ by preventing damage (Turner and Tennant, 2010). Besides that, the ‘consuming of income not capital’ which means that the extraction of the renewable resources is not exceeding the rate at which they are renewed (Gilbert, 1996).

According to Silvius (2010), one of the objectives at the international project management association Seminar in 2010, was to translate sustainability concepts into a practical tool for project management

practitioners; such tool was the “Sustainability Checklist”. The developed checklist consists of factors and indicators related to economic, environmental and social sustainability dimensions to be used by project managers as shown in Table 1.

Table 1: Project Management Sustainability Checklist. (Cited by Silvius, 2010).

Economic Sustainability	Return on Investment	- Direct financial benefits - Net Present Value
	Business Agility	- Flexibility / Optionality in the project - Increased business flexibility
Environmental Sustainability	Transport	- Local procurement - Digital communication - Traveling - Transport
	Energy	- Energy used - Emission / CO2 from energy used
	Waste	- Recycling - Disposal
	Materials and Resources	- Reusability - Incorporated energy - Waste
Social Sustainability	Labor Practices and Decent Work	- Employment - Labor / Management relations - Health and Safety - Training and Education - Organizational learning - Diversity and Equal opportunity
	Human Rights	- Non-discrimination - Freedom of association - Child labor - Forced and compulsory labor
	Society and customers	- Community support - Public policy / Compliance - Customer health and safety - Products and services labeling - Market communication and Advertising - Customer privacy
	Ethical behavior	- Investment and Procurement practices - Bribery and corruption - Anti-competition behavior

This checklist was one of the foundations for Silvius and Schipper (2010) in developing a model for sustainability integration in project management. This model serves as a practical tool for assessing the level of sustainability performance in a project, which helps organizations in determining their sustainability maturity level, and so, organizations can prepare themselves to the new project management profession (Silvius and Schipper, 2010). This model assesses the current sustainability performance situation (dark colors) and compares it with the desirable situation (light colors) for each sustainability aspect as illustrated in Figure 1.

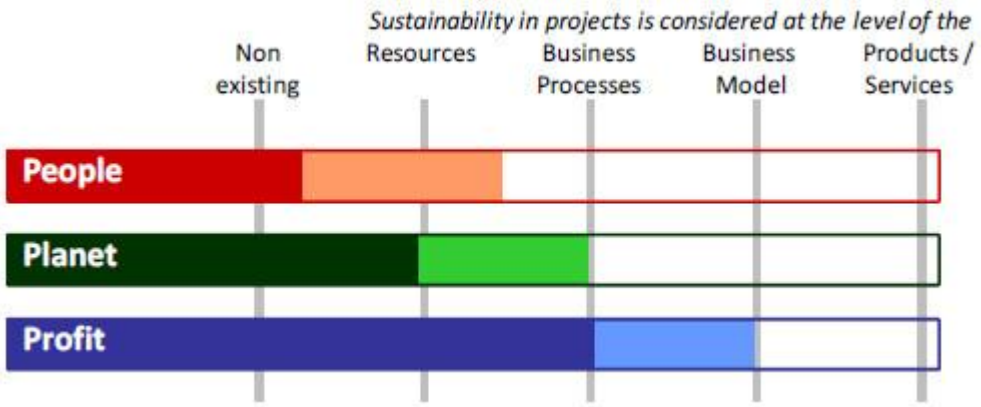

Figure 1: The Sustainability Maturity Model-Reporting Format (Cited by Silvius and Schipper, 2010).

Silvius and Schipper (2010) maturity model provides a useful instrument for assessing sustainability performance in projects and projects management, but it does not provide guidance for how to improve the sustainability performance in practice. Therefore, in another research, Silvius and Schipper (2015) developed a conceptual sustainable project management maturity model 'SPM3' as a practical tool to assist project

organizations to operationalize the concepts of sustainability into practical activities and develop their sustainability performance (Silvius and Schipper, 2015). This Maturity model is designed as a matrix of project social, environmental and economic sustainable project management indicators collected from literature, and assessed based on four maturity levels by using a questionnaire, which consist of assessment questions for project activities. The SPM3 follows the CMM maturity levels (Pöppelbuß and Röglinger, 2011) as presented in Table 2. With this description of the different sustainability maturity levels and sustainability indicators, the SPM3 provides an active guide on how to develop the integration of sustainability in project management processes.

Table 2: The SPM3 Maturity Levels. (Cited by Pöppelbuß and Röglinger, 2011)

Strategy	**Maturity level**	**Description**
do no harm ↕ positive contribution	Level 1: Compliant	Sustainability is considered minimalistic and implicit, and (only) with the intention to comply with laws and regulations.
	Level 2: Reactive	Sustainability is considered explicitly, with the intention to reduce negative impacts of the project.
	Level 3: Proactive	Sustainability is explicitly considered as one of the areas that the project contributes to.
	Level 4: Purpose	Contributing to sustainability is one of the drivers behind the project and sustainability considerations are included in the justification of the project.

In another study concerning linking sustainability and projects management, Martens and Carvalho (2016) explored the gap between sustainability and project management in order to identify the key aspects

of a sustainable project management context and its importance. They found that the sustainable innovation business model, stakeholder's management, economic and competitive advantage, and environmental policies and resources saving are the key aspects for integration sustainability principles in the project management practices. With this blooming of sustainability studies in project management field, Silvius (2017) revised 71 articles on sustainability in project management. He concluded that sustainability qualifies a new, distinct, and emerging school of thinking in project management. Such sustainability school has characteristics, which are considering projects in a societal perspective, having a management for stakeholders' approach, applying triple bottom line criteria, and taking values based approach to projects and project management.

In the light of the significant need to adopt sustainability principles in project management practices around the world; the construction industry is considered as an important sector for the attainment of the sustainable development concepts (Sev, 2009). This industry is different from other industries due to its size, activities, number of people involved in project lifecycle, service provided, besides its impact to the environment and surrounding community (Asad and Khalfan 2006). For example, it produces an enormous amount of wastes and consumes a massive amount of energy, as well as the effects it causes to the surrounding community,

which results in a serious demand to implement sustainable practices at all construction levels (Yosef et al., 2017).

2.6 Sustainable Construction Project Management (SCPM)

In reference to Bourdeau (1999), since 1994, sustainable construction was proposed as the responsible management of a health-built environment based on resource efficient and ecological principles. It was originally described as the responsibility of construction sector in the realization of sustainability (Hill and Bowen, 1997). Huovila and Koskela (1998) defined SCPM as a new construction way, which requires considering the sustainability requirements for all decision making during the lifecycle of the construction project. According to Raynsford (2000), it is the processes of delivering built assets (building, structures and supporting infrastructures) in a profitable and competitive manner, which considers the customer satisfaction and enhance the quality of life; offer flexibility to accommodate users' changes in future; support the natural and social environment; and increase the efficient use of resources. In addition, the International Council for Research and Innovation in Building and Construction (CIB) defined SCPM as "the sustainable production, use, maintenance, demolition, and reuse of buildings and constructions or their components" (CIB, 2004).

In the context of what was mentioned above, plethora of studies concerning the concept of sustainability in CPM were developed. Ugwu and Haupt (2007) found that the adoption of sustainability factors has led to a more

sustainable project delivery performance, since it contributes to better decision making, efficient project delivery, minimizes resource consumption and waste generation, beside less construction problems and delays. In addition, the implementation of sustainable construction principles causes better project performance such like safe construction, air quality and dust control, noise and vibration minimization, maintenance and operation costs minimization, cultural heritages protection, quality and time compliance, and community acceptance (Lim, 2009).

In line with the purpose of this study, Sanchez and Lopeze (2010) shed the light on the importance of developing a sustainability indicator, practices and factors set to meet the sustainability targets in urban development, besides the control and monitor of such indicators over time. Factors affecting sustainable construction include the minimization of resource consumption; maximization of resource reuse, the use of recyclable and renewable resources, the protection of environment, and pursuing quality in creating the built environment (Miyatake, 1996). Moreover, according to Chaharbaghi and Willis (1999), the education is one of the most critical factors to change the existing values and practices related to sustainability principles. In addition, the United Kingdom Government in their sustainable construction strategy proposed significant sustainable construction factors by widening the basic themes. Such factors include: the design for less waste generation, minimum resources consumption, choice of material with less impact to environment with ability to reuse,

lean construction, obviate pollution, preserve biodiversity, conserve water resources, respect people and local government, set targets and monitor and report (Raynsford, 2000). In addition, one of the most significant factors affecting the adoption of sustainability in construction management is the 'Knowledge Management', which means managing the knowledge required by project teams, due to the unique characteristics of construction projects, especially the dynamic participation of a multi-disciplinary team, the reliance on previous heuristics and the tight schedule (Shelbourn et al., 2006).

As supported by Sourani and Sohail (2005), most of studies in the sustainable construction field concentrated on the environmental aspect of sustainability, while very few studies discussed the social aspect. Therefore, they suggested potential factors for realizing social sustainability through procurement strategies in the context of developed countries. Which included the integration of sustainability in project contract specifications, the selection of procurement system from sustainable perspective; which considers the client needs, contractor requirements and project specifications, using multi-criteria decision-making technique, the selection of contractors based on sustainability value, and providing incentives and rewards. More recently, Abdel-Raheem and Ramsbottom (2016) identified other ten social factors for sustainable construction management. These factors include the respect and protection of communities impacted by the project, improve quality of living, diversity with employees by acquire a wide spectrum of workforces from

varieties of backgrounds of the community. In addition to minimize using of non-renewable resources, maintaining ethics and responsibility, provide feedbacks, provide education and training on social sustainability practices, global networking for continuous updating, and keep accountability of the organization.

2.7 Sustainable Construction Project Management in Developing Countries

Developing countries need special efforts for shifting from traditional project management to more sustainable management practices, since perceptions of sustainability concepts in such countries differ in various contexts from those of developed countries (Reffat, 2004). These countries suffer from high level of land degradation, fresh water shortage, air pollution and insufficient infrastructure services due to the rapid urbanization (Ofori, 2000). Moreover, developing countries lack financial resources, experience in sustainable construction management, legal and administrative systems, enforcing regulations and encourage of better behavior through giving incentives, besides the need for massive amount of construction resources (Chen and Chambers, 1999; Shafii et al., 2006).

SPM is becoming a pressing issue in developing countries (Shen et al., 2010). These countries need huge investments in construction projects; especially infrastructure construction projects, in order to reduce urbanization constrains and meet their development goals (Diaz-Sarachaga et al., 2017).

In 1999, the international council for research and innovation in building and construction (CIB) published its Agenda 21 for sustainable construction, then a special R&D Agenda 21 for sustainable construction in developing countries was published as a part of the action plan of the CIB Agenda (Du Plessis, 2002). This R&D agenda is based on a matrix of technological, institutional and value-system "the way things are valued and the social, spiritual or moral values that guide decisions" enablers, such enablers are informed by local human needs and both local and global environmental needs (Du Plessis, 2007). Table 3 shows the proposed research and development areas of these enablers, which constitute a guidance framework for development.

Table 3: Framework of Enablers for the R&D Agenda 21 (Cited by Du Plessis, 2007).

Time	**Technological**	**Institutional**	**Values**
Immediate	• Benchmarking & Assessment • Knowledge systems & data-capturing	• Clarified roles and responsibilities • Education • Advocacy & awareness • Cooperation and partnership	• Mapping the route to change • Understanding the drivers • Re-evaluating heritage
Medium	• Technologies to mitigate impact	• Linking research to Implementation • Develop regulatory mechanisms	• Develop a new way of measuring value and reward • Develop codes of conduct
Long term	• Technologies of the future • Changing the construction process	• Strengthening implementing mechanisms • Using institutions as drivers • Regional centers of excellence	• Corporate social responsibility reporting

With the appearance of the Agenda 21 for sustainable construction in developing countries, too many researches concerning sustainable construction concept appeared in these developing economies. For example, in China, Shen et al., (2010) concluded that it is important to shift from traditional project feasibility study to a new approach incorporating sustainable development principles with participation of all stakeholders, including government, clients, consultants, architectures, contractors and suppliers. Table 4 includes their findings of the key environmental, social and economic performance attributes for successful implementation of sustainable construction management practices.

Table 4: Key Performance Attributes for Successful Sustainable Construction Management Practices. (Cited by Shen et al, 2010).

Environmental performance attributes	Social performance attributes	Economic performance attributes
• Eco-environmental • sensitivity of the project location • Waste assessment • Air impacts • Environmental friendly design • Water impacts • Energy consumption performance • Noise assessment • Land consumption	• Influence to the local social development • Safety standards • Provision capacity of employment • Improvement to the public health • Provision capacity of public services • Cultural and heritage conservation • Provision capacity of public infrastructure facilities • Development of new settlement and local communities • Provision of the infrastructures for other economic activities	• Governmental strategic development policy • Financing channels • Tax policy • Investment plan • Demand and supply analysis • Life cycle cost • Market forecast • Life cycle profit • Project function and size • Finance risk assessment • Market competition • Return of investment (ROI) • Location advantage • Net present value (NPV) • Technology advantage • Pay-back period • Budget estimate • Internal rate of return (IRR)

In line with the previous study, and due to the importance of the infrastructure construction project in the attainment of development, and its associated significant impact on the environment, especially in developing countries (World Bank, 2006), there is a need for effective sustainable construction assessment indicators (Griffith and Bhutto 2008). Therefore, Shen et al., (2011) introduced key assessment indicators for infrastructure construction projects in China. They used a survey given to government officials, professionals and clients in Chinese construction industry. They found that in social dimension indicators, the "public safety" was the most significant social factor, and other important social factors are the provision of ancillary amenities to public to economic activities, scale of serviceability and public sanitation. For environmental dimensions, the "effect on water quality" was ranked with highest scores as the most important factor, other environmental factors are the effect on air quality, land pollution, influence on public health, environmental protection measures in project design and energy saving. Moreover, for economic dimension factors, the "analysis of market supply and demand" ranked as the most important economic factor, and then other less important economic factors are the life cycle benefit, financial risk, project budget, life cycle cost, internal return ration (IRR) and the payback period.

Previous studies presented sustainable construction management factors in general. In contrast, Banihashemi et al. (2017) presented the critical success factors to integrate sustainability in construction management practices in

developing countries by adopting a conceptual framework for innovation in construction sector. This framework for innovations integration in construction context is suggested by Slaughter, (2000), by following consecutive project stages, which are the identification, evaluation, commitment, preparation and implementation stages as shown in Figure 2 below.

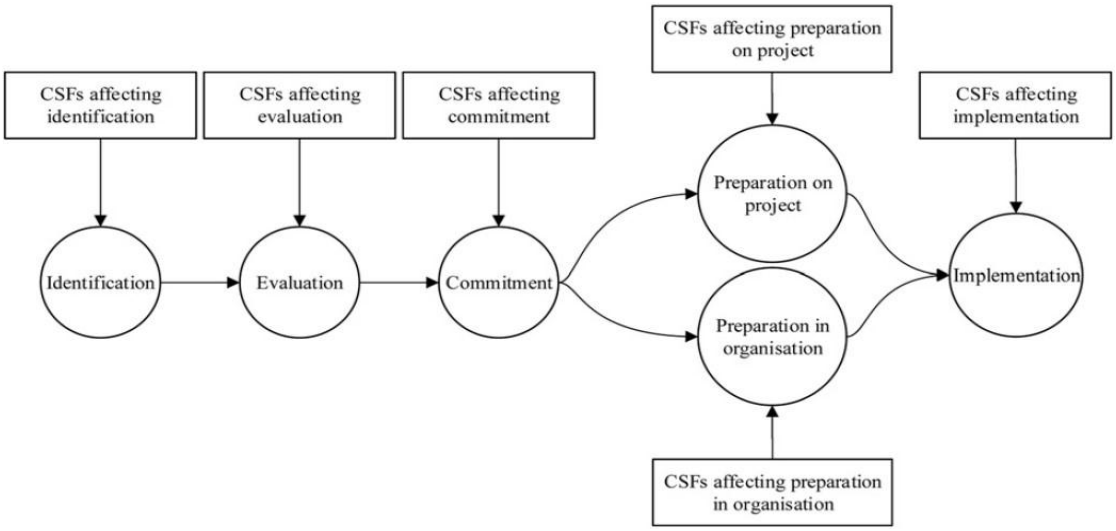

Figure 2: Conceptual Model for Innovation in Construction Stages. (Cited by Banihashemi et al., 2017*).*

They found that the most influential factors for successful implementation of sustainability in construction project management in developing countries. Critical success factors are the role of clients, knowledge management, high quality workmanship, strategic direction and health and safety protocols, project managers' knowledge, skills and abilities and tighter control over construction activities. These CSFs are discussed in view of the identification, evaluation, commitment, preparation and

implementation phases of sustainability integration into construction project management practices as shown in Table 5 below.

Table 5: The Most Influential Critical Success Factors to Integrate Sustainability in Construction Projects in Developing Countries. (Cited by Banihashemi et al., 2017).

Stage	CSFs
Identification	• Client's commitment to the needs of other stakeholders. • Enacting required policies in supporting sustainability principles establishment in construction projects by governmental and professional bodies. • Clearly defined goals and prioritizing all stakeholders.
Evaluation	• Knowledge and awareness of sustainable project delivery in the Project management team. • Dominance of constructive relationships among project stakeholders.
Commitment	• Strong commitment to sustainable project delivery from project stakeholders. • Emphasis on high quality workmanship.
Preparation in organization	• Creating accountabilities, expectations, roles and responsibilities for the organization. • Implementing effective health and safety protocols.
Preparation on project	• Tenure of project managers. • Project manager's experience and competence.
Implementation	• Comprehensive contractors' portfolio investigation in terms of their level of awareness of the Sustainability concept and their previous records of sustainable projects implementation. • Water and noise pollutions minimization during execution. • Implementing a particular project monitoring and feedback methodology to evaluate the current state of sustainability and rectify any discrepancy and/or deviation

For enhancing and monitoring the application of such development guidelines, Zhang et al., (2014) suggested a paradigm shift for project management organizations through the involvement of “Environmental Representative” (ER) along with project stakeholders throughout the different phases of the construction projects. The (ER) is an independent

person who is appointed by the government, for monitoring the environmental performance throughout all stages of the construction process. Such like monitoring site workers, ensuring provision environmentally-friendly materials by the suppliers, beside monitoring the balance between the project triple objectives (cost, time and quality) and the sustainable environment objectives, raise public awareness and to guide the contractors in implementing the Environmental Impact Assessment. In addition, the involvement of the ER ensures that all project parties have a shared goal of protecting the environment through the different project stages, thus promoting the cooperation between all participating members (Zhang et al., 2014).

In light of what was presented, and with growing worldwide attention to the importance of integrating sustainability concepts in the construction management field, several construction sustainability assessment and rating tools were developed around the world (Diaz-Sarachaga et al., 2016).

2.8 Barriers and Drivers to Successful SCPM

In spite of the presented SCPM importance, several countries failed to adopt the SD requirements in their CPM practices or where scantily applied due to several reasons and barriers. According to Van Bueren and Priemus (2002), the fragmented nature of the CPM process and the various participants within each stage affects the decision making process due to the decentralization, and the cost-efficiency goals of each participants, that need improve communications between players within the different stages.

For Ofori-Kuragu et al. 2015, the highest ranked barriers to SCPM are lack of governmental commitment, fear of high costs, lack of professional knowledge, the cultural change resistance, and absence of supporting legislations. AlSanad (2015) concluded that lack of governmental enforcement factors is an essential barrier besides the economic situation and the limited awareness on environmental and social issues.

Another barrier to successful SCPM are lack of training on the concept of sustainability, lack of legal aspects concerning sustainability in construction management, lack of information on sustainable construction issues and solutions, and lack of stakeholders' interest on sustainability issues (Serpell et al., 2013; Durdyev et al., 2018).

Due to the explored and presented barriers to successful SCPM implementation, the existing literature suggested number of drivers to change that might encourage institutions and governments to change the CPM practices to become more in line with SD agendas. According to Gan et al. (2015), the most critical drivers of sustainable performance in CPM are awareness, knowledge, and education on sustainability concepts and requirements among the stakeholders, in addition to the legal aspects, legislations, regulations and governmental enforcement. For Oke et al. (2019), the institution image and reputation due to sustainable performance, education programs, cooperative partnership, linking research to the implementation mechanisms, and knowledge sharing are key drivers to SCPM.

Other drivers mentioned in literature are resource conservation, waste reduction, satisfaction of local community, less rework and field adjustments, tax reduction incentives (Manoliadis et al., 2006; Circo, 2007; Ahn et al., 2013)

2.9 Construction Project Management in Palestine

Palestine has a fragile environment, faced with significant problems that seriously should be considered to meet current needs without compromising the future. Such as the land degradation, the acute shortage of fresh water and other resources, besides the rapid urbanization and its associated impacts on environment, air pollution and pressure on the available infrastructure (Enshassi and Mayer, 2005).

In spite of the importance of the construction industry as a driving force in the Palestinian economy, it faces many problems affecting its performance (Enshassi et al., 2006). Many construction projects report poor performance due to several causes, such as the lack of managerial experience and financial resources, several amendments, lack of sufficient leadership skills, shortage of material, lack of monitoring and feedback, lack of legal and administrative systems, and of course the political situation (UNRWA, 2006). More and more, the labor performance in construction projects faces inefficient performance due to the lack of communication between projects parties, the reworks, the financial problems, lack of material, and lack of experience (Ibrahim, 2013). Furthermore, using data from projects in the West Bank, Mahamid (2013) explored causes of inefficient road

construction projects implementation; he found that the insufficient knowledge in contracts, insufficient estimation of time, and incomplete documents seriously affects the implementation of such construction projects.

In Palestine, until now there are no enough researches or guiding tools that relate the sustainable principles with CPM activities. At the same time, there is a pressing need to shift from traditional project management to a more sustainable management practices, which considers the social, environmental and economic impacts associated with the construction sector. Moreover, due to the significant rule of identifying practices affecting sustainability in the project management, which guides project stakeholders to enhance the sustainable management performance, it is urgent to develop a checklist of sustainable CPM factors in reference to construction industry in Palestine. In addition, it is necessary to build and develop a guiding model for translation of sustainability principles into concrete action throughout the project lifecycle (Ugwu et al., 2006).

2.10 Research Conceptual Framework

With the growing attention toward the construction sector role in the sustainable development agendas, several studies suggested rational and conceptual frameworks for sustainability attainment in the construction management process. For example, Hill and Bowen (1997) proposed a multi-stage framework for application of environmental management and environmental assessment in the construction management, the proposed

framework required the application of environmental assessment in the project planning and design stages, and adopting an environmental management system during the project construction and operation.

Sev (2009) proposed another framework that aims to implement sustainability principles and strategies to the construction projects from life-cycle perspective. Sev framework is built on three fundamental principles, which are resource management, life-cycle design and design for human and environment. Each principle involves methods and strategies for application during the construction project life cycle as shown in Figure 3, and so, it constitutes an assessment tool for stakeholders of construction industry.

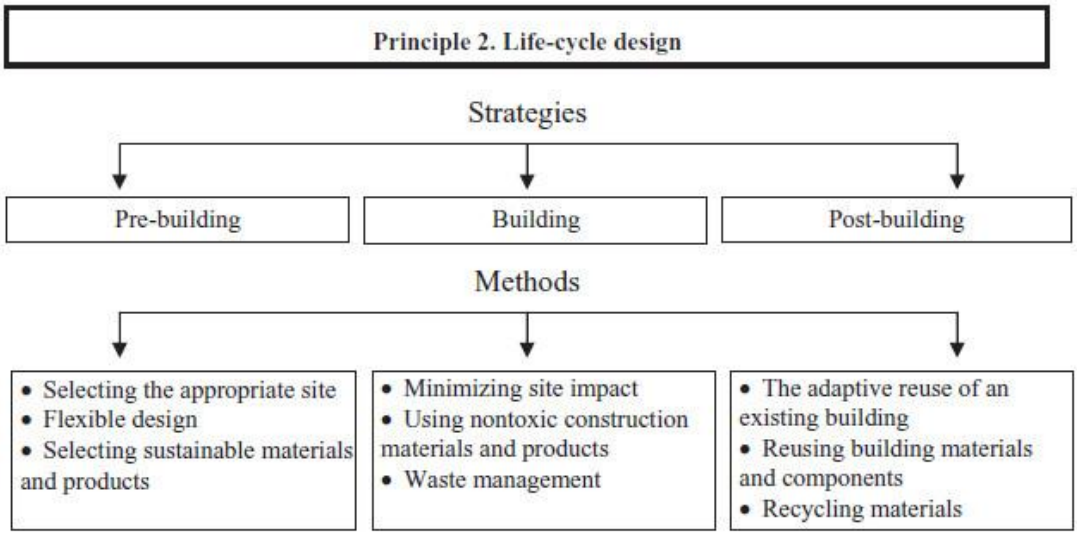

Figure 3: Methods to Achieve the 'life-cycle design' Principle. (Cited by Sev, 2009).

In addition, Tan et al. (2011) proposed a framework that introduced sustainability practices in the construction sector and its effect on contractor's competitiveness as shown in Figure 4. This framework helps

contractors in the construction sector to improve their competitiveness by developing their sustainable performance. The proposed framework presented understanding principles and legislations as the fundamental step for sustainability adoption, the second step is the sustainability policy as a commitment statement by the top management about the goals to be achieved. Then the strategy to achieve these goals, after that, the institution should identify their sustainable construction practices, and finally, the review and correction of their sustainable construction performance.

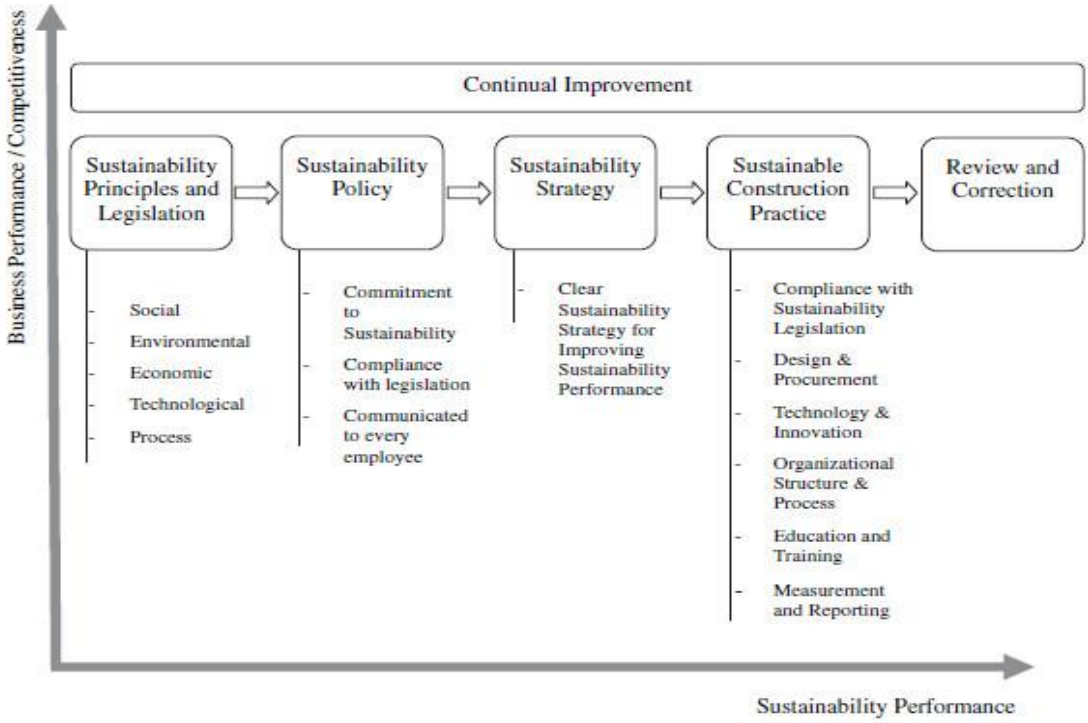

Figure 4: A framework to Improve Contractors' Competitiveness from Implementing Sustainable Construction Practice. (Cited by Tan et al., 2011)

In line with the presented literature, the conceptual framework in this study is proposed to follow explored sustainability practices from literature as shown in Appendix (A) through the CPM consecutive stage.

2.10.1 Construction Project Management Stages.

Construction project management process is divided into three consecutive sections; Pre-construction, Construction and Post-construction (Tregenza, 2004). The pre-construction section is the initial stage of construction project management and consists of the Inception & Feasibility, Design, and Tendering stages shown in Figure 5 (Singh, 2002).

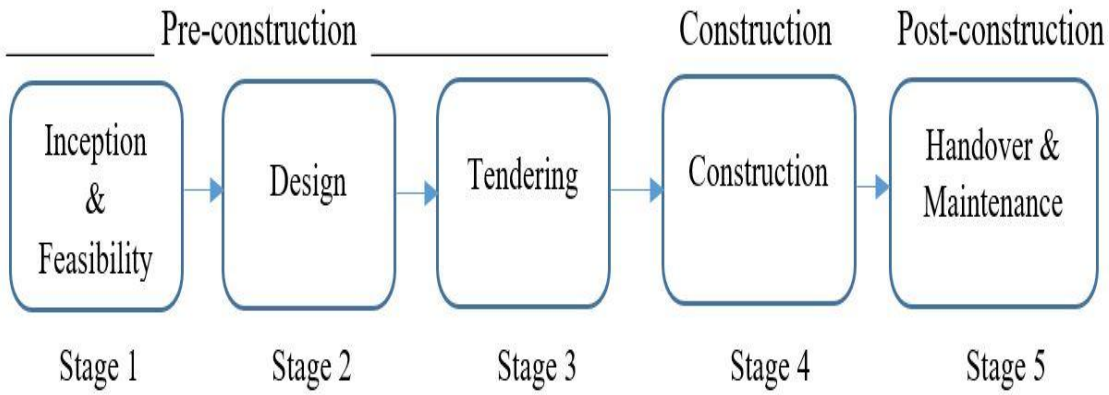

Figure 5: Construction Management Stages.

2.10.1.1 Pre-Construction Section

As mentioned before the pre-construction stage consist of three consecutive stages: Inception & feasibility, design, and tendering stages. The inception & feasibility stage is described as the pre-project planning, and it is more concerned with the client requirements (Hendrickson & Au, 2000). This

initiation stage consists of land matter, project objectives, project organizational structure, and the project feasibility study (Gahlot, 2007). The design stage aims to acquire a complete and accurate understanding of project requirements, it encompasses the project brief, budget preparation, conceptual and schematic design development, detailing design, planning approval, and value engineering (Hendrickson & Au, 2000). The last stage of pre-construction section is "tendering", in this stage the tender documents are issued and evaluated to choose the required contractor (Al-Reshaid et al., 2005).

2.10.1.2 Construction Section

The construction stage involves the execution of designed construction works within the agreed time, cost, and quality. It is the most difficult and resource-intensive stage which require a careful planning to save manpower, prevent money and time wastage, and avoid disruption of project schedule. According to Gahlot (2007), construction stage consists of planning activities and site operation activities, the planning activities includes construction schedule, manpower schedule, plant and equipment schedule and material delivery schedule, while the site activities includes temporary and permanent works, supply of material and equipment, coordination of sup-contractors, and supervision for quality control.

2.10.1.3 Post-Construction Section

This stage starts after the completion of construction activities, it concerns the continuous monitoring and management of maintenance needs for the constructed facility (Kagioglou et al., 2000). It also includes records of the actual performed works, thoroughly inspection and defect removal, preparing operating instructions and maintenance manual, and carrying out tests for performance (Gahlot, 2007).

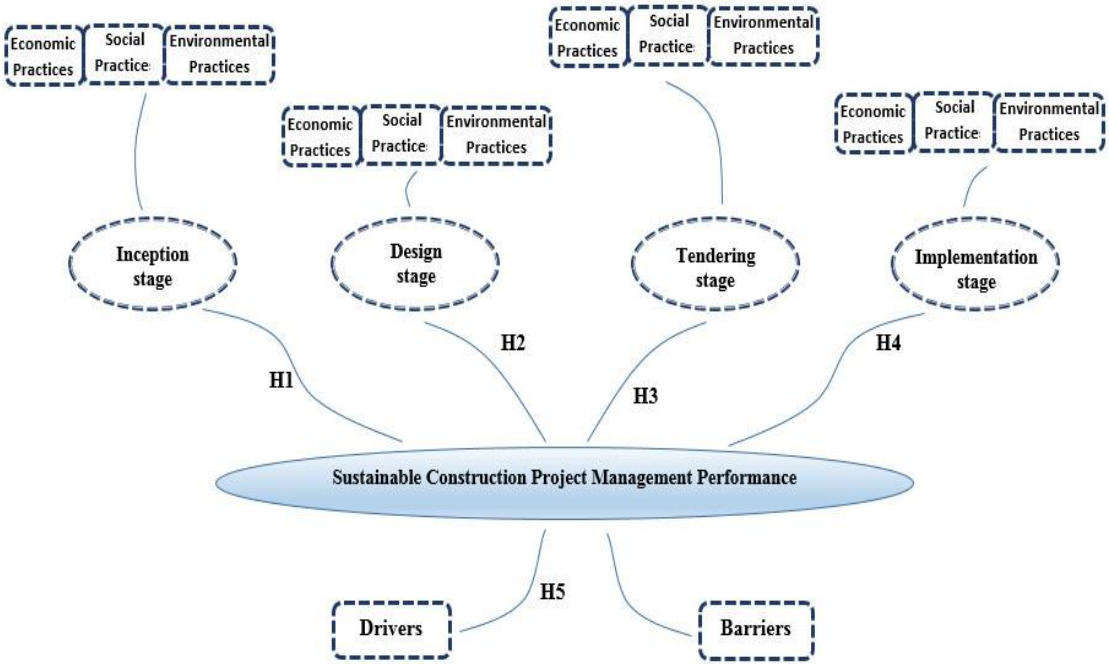

Figure 6: Research Conceptual Model.

Based on what was mentioned above, Figure 6 demonstrates the research model and the proposed strategy to explore sustainability practices and factors in the Palestinian CPM field.

Chapter Three

Research Methodology

3.1 Chapter Overview

This chapter provides a description of how the methodology was chosen in order to reach the research objectives in appropriate steps. The research design, research strategy, methodology flow charts, population and sample size, data collection techniques are all presented.

3.2 Research Design

Educational research has one of these three objectives: to explore issues and find answers to questions (for academics), to share policy (for policy makers), and to improve a practice (for practitioners) (López-Alvarado, 2017). In relevance to the study objectives and questions, there are three research types: exploratory, descriptive, and explanatory research (Jalil, 2013). Exploratory study is utilized when the purpose of the study is to develop an instrument from qualitative data (Creswell, 2002, p. 550), and when the research problem is not sufficiently defined and explored before (Brown, 2006). Descriptive study is concerned with describing the characteristics of a particular individual, group or situation (Kothari, 2004, p. 37). While Explanatory study is to explain correlations between variables, where the change in one variable are reflected in change in the other (Creswell, 2002, p. 340).

Moreover, according to Kothari (2004, p. 37), the research purpose is fallsinto one or more of four objectives. To gain familiarity with a phenomenon or to achieve new insights into it, known as exploratory study. To portray accurately the characteristics of a particular individual, situation or a group, known as descriptive study. To determine the frequency with which something occurs or with which it is associated with something else, known as diagnostic study. Finally, to test a hypothesis of a causal relationship between variables, known as hypothesis-testing study.

This study aims at exploring and identifying sustainability factors affecting CPM practices in the West Bank/ Palestine. Therefore, to achieve the objective, an exploratory research approach is adopted to identify sustainability factors, and build a conceptual framework of these factors.

3.3 Research Strategy

In scientific researches, there are two main research strategies (i.e. approaches): quantitative research strategy and qualitative research strategy (Kothari, 2004, p .5). According to Newman (2000), the quantitative approach is used for the aim of developing an explaining theory of what was experienced by observing and interpreting reality, while the qualitative approach is used when the researcher starts with a hypothesis or theory and then test it for conformation or disconfirmation. It is also possible to use a mixed methodology approach, which refers to researches that combine methods associated with both quantitative and qualitative research (Bryman, 2016, p .37).

A justification for using a mixed method design (i.e. use both quantitative and qualitative data) in the exploratory research is that it is important to test the qualitative explorations in the first stage by collecting quantitative data in second stage. In addition, quantitative data provides the opportunity to gather data from a large number of people and generalize results, whereas qualitative permits an in-depth exploration of a few individuals (Creswell, 2002, 548). In addition, according to Bowen et al. (2017), combining the qualitative and quantitative data in one study provides greater understanding and insight into the research topic.

This research combines qualitative and quantitative methods. The combination of these methods in one study is regarded as the most effectual in management field researches (Creswell et al., 2003). The qualitative part of this research employs face-to-face interviews with experts, professionals, and construction project managers. In addition, to review the literatures on sustainable construction project management, since this research builds on the existence body of knowledge in this area.

First, the purpose is to understand how sustainability principles, which presented in literature, are applied in construction project management. This is in line with the interpretation of an **exploratory nature** as presented by many authors, which is to gain answers of open-ended questions for the aim of new knowledge creation (Adams et al., 2007; Baxter et al., 2008; Saunders et al., 2012). A pool of factors affecting sustainable management practices in construction projects are collected

from literature, then these factors retracted and refined by investigating their importance in the Palestinian construction context through interviewing experts, professionals and project managers in construction sector. Much researches concerning sustainable construction management involves asking and obtaining answers to questions through conducting surveys of people by questionnaires and interviews "face-to-face or telephone interviews" (Diaz-Sarachaga et al., 2017; Ugwu and Haupt, 2007; Shen et al., 2010; Banihashemi et al., 2017).

After collecting data in the first stage, such data are analyzed to discover and explore the most influential sustainability factors as well as the relation between these factors in order to form a framework of the critical sustainability factors for construction project management in Palestine. Creswell et al. (2003) defined this sequence of qualitative data collection which followed by a quantitative data analyses as "Sequential Exploratory Design".

Therefore, the logical framework to conduct this study is by using the "Mixed Exploratory Sequential Design Methodology". Recently, this framework has been followed by several studies (Ramaraj and Nagammal, 2017; Law et al., 2017; Watson et al., 2017; Banihashemi et al., 2017). It is also recommended to combine mixed methods in construction management researches (Pinto and Patanakul, 2015).

3.4 Research Methodology Flow Chart

This section summarizes and clarifies the followed methodology in this research, Figure 7 illustrates the methodology flow chart of the study, which consists of six stages as shown below.

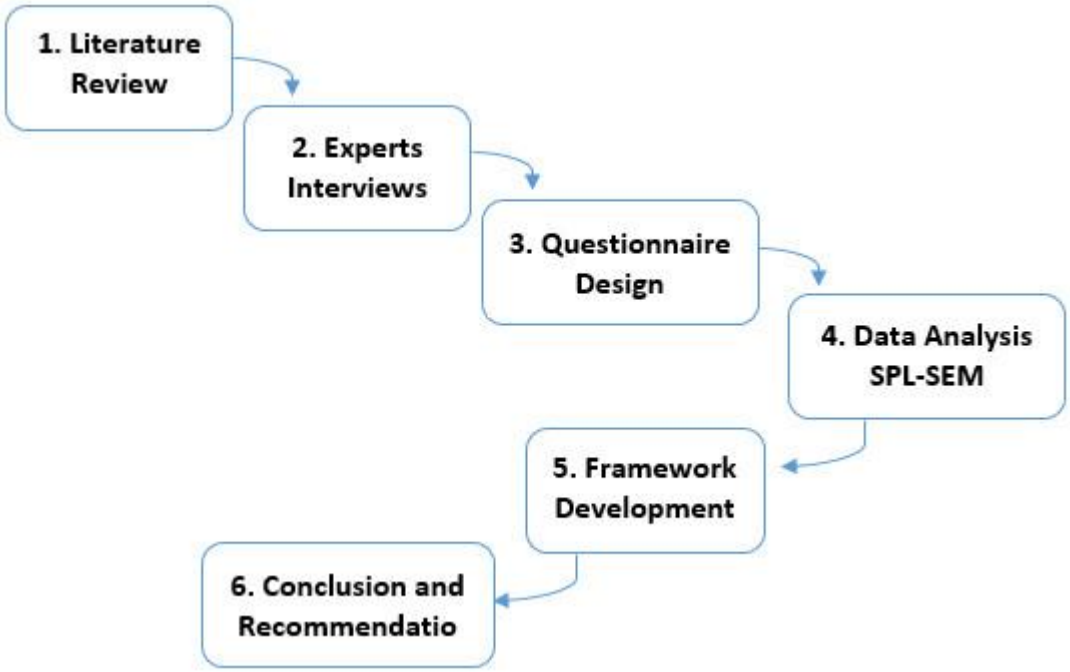

Figure 7: Research Methodology Flow Chart**.**

Stage 1: the first phase of the study includes a review of the existing literatures concerning project management, sustainable development, construction management, sustainable project management, and sustainable construction project management. A pool of sustainability factors affecting construction management field were collected to refine it in the next phase.

Stage 2: This phase includes a collection of qualitative data by semi-structured interviews, which combine some structured questions with some unstructured exploration of participants' opinions (Wilson, 2014). Semi-

structured interviews have a number of prepared questions, but such questions are relatively open, can be changed in wording and sequence, and can be modified based on the interviewer's opinion, at the same time, it should be improved in a theorized and careful way (Wengraf, 2001).

The need for qualitative techniques "interviews" is to verify the findings from literature review by different perceptions and opinions of experts and stakeholders concerning sustainable construction project management practices in the West Bank/ Palestine "content validity". This step deems to suit the collected construction sustainability factors and indicators to the Palestinian context. It explores multiple meanings that participants attached to sustainability perceptions as well as the influential factors that may aid or impede the integration of sustainability considerations. Additionally, it embodies the social reality of principles, which change from project to project, due to the surrounding conditions and the participant's subjective natures (Bryman, 2012, p.31).

Stage 3: this phase includes the second stage of data collection by using a questionnaire, which is proposed to assess the importance of the refined sustainability Practices list on sustainable construction projects management. Respondents will indicate their level of implementation of the previously selected sustainability practices on the sustainable construction management in Palestine by using 5 points Likert scale.

Stage 4: this phase includes data analysis by following the Partial Least Square (PLS-SEM) methodology. The Smart PLS statistical software was used to perform data analysis and get results.

Stage 5: this phase consists of the conceptual framework development. This framework is proposed as a useful instrument for practitioners and project managers in construction projects, since by using this framework they can enhance their sustainable construction management performance.

Stage 6: this phase consists of conclusions and recommendations to the practitioners in the Palestinian construction industry, in addition to the future researches suggestions.

3.5 Research Population and Sample Size

The proposed target population of this study is the consulting engineering offices, construction governmental departments, NGOs that implement construction projects, and construction-contracting firms which participate in the CPM stages in the West Bank/Palestine. According to the Engineering Association headquarter in Ramallah-West Bank, engineering offices are classified in relevance to their experience into four levels, starting from 3rd class engineering office and ending with consultant engineering office with highest experience level (Palestinian Engineers Association, 2014). In reference to the Engineering Companies and Offices Body Annual report for the year 2017, the number of the engineering

companies and offices in the West Bank reached 697 offices, and the number for each classification is as illustrated in Table 6 below.

Table 6: The Distribution of the Engineering Offices According to their Classification.

Number of Engineering Offices	Classification
241	Consultant office
140	1st class Engineering office
249	2nd class Engineering office
67	3rd class Engineering office
697	Total

For contracting companies, and according to the Palestinian Contractors Union (PCU), contracting companies are classified under five major specialties: building construction, road construction, water and sewage, electromechanically, and public works. For each field, contractors are classified into different levels in relevance to their experience, capital, equipment, and the executed projects. For road, building, water and sewage construction-contracting companies, there are 5 classifications. In this study the target population is the 1st classified companies which participate in CPM from inception stage, that to ensure acceptable respondents experience.

Now, in order to estimate the required minimum sample size, in PLS-SEM, the "10-times rule" is the widely used estimation method (Hair et al., 2011). This method depends on the maximum number of model links, where the minimum sample size should not be less than 10 times the maximum number of inner or outer links pointing at any latent variable in the model (Goodhue et al., 2012). In this study, the maximum number of

links is six pointing at the SCPMP latent variable as shown in Figure 6, therefore according to the "10-times Rule", the minimum number of study sample should not be less than 60 samples.

The "10-times rule" is very simple for application, that why so many researches preferred to use it, but it tends to yield imprecise estimates (Kock and Hadaya, 2018).

An alternative to the "10-times rule" is the minimum R-squared method, which in addition the maximum number of arrows pointing at a latent variable, the minimum R-squared method depends also on the significance level used, and the minimum R-square in the model, which make it more relatively accurate than the "10-times rule".

In this study, the used significance level is 0.05, the maximum number of arrows pointing at on construct is six, and the minimum R-square in the model is 0.697. Therefore, with reference to Table (B) in appendix (B), which is a reduced version for the minimum R-squared method focuses on the significance level of .05 by Hair et al. (2014, p. 21), the closest cell shows a minimum sample size of 48 samples.

3.6 Field Survey and Data Collection

Survey is a widely used method to provide a representative sample of the area of the study. It is considered as an effective and efficient way of looking at greater number of variables compared with experimental approach (Galiers 1992), and it involves eliciting data from respondents

using several methods. Data collection methods in survey studies include interviews, questionnaires, observation, examination of documents, and a variety of other motivational techniques such like projective tests (Robson, 2002). In general, in survey research, interviews, observing people and phenomena, and administering questionnaires are the main three main data-collection methods (Sekaran and Bougie, 2003).

There are different types of data required in this research: the sustainable practices, drivers, and barriers affecting CPM, from existing literatures, and the surveyed data from practitioners of construction project management in the West Bank/Palestine.

In this research, two of the data collection methods are used, which are the interviews and questionnaire. The first method was used to explore sustainability practices, drivers and barriers affecting SCPM in the West Bank through interviewing academics and professionals who are involved and experienced in the sustainable construction field. The latter is used to build and form the proposed conceptual framework of the study.

3.6.1 Interviews

The interview is simply a qualitative approach to social sciences, which aims to collect descriptions of the life world of the interviewees through a conversation (Kvale, 1996). In other words, interviews are the suitable data collection tool to gather in depth information concerning specific topic or subject (Schostak, 2005). Researches demonstrated four types of

interviews: the first type is the structured interview, where interviewees has less freedom, since the questions are direct and predetermined with immediate responses (Alshenqeeti, 2014). The second type is the semi-structured interview, which is more flexible than the first type, and it allows the interviewer to get information by expanding interviewee's responses (Rubin & Rubin, 2005). The third type is the unstructured interview, where greater flexibility is allowed for both; the interviewer and the interviewees (Gubrium and Holstein, 2002). Finally, the fourth type is the focus group interviewing, where a purposive group are selected, to discus and focus on a specific topic (Barbour and Schostak, 2005).

In this study, semi-structured interviews are utilized with eleven academics and professionals who were selected carefully based on their experience in construction projects management field and their cognition in sustainability knowledge.

3.6.1 Interview Content Validation

Before proceeding in the interviewing process, the prepared semi-structure interview was validated by consulting three recommended academics in the Civil Engineering Departments in different Palestinian universities as shown in Appendix (C). They were asked to comment on the proposed interview language, order, relativeness, consistency, time, and the overall structure.

3.6.2 Questionnaire Survey

The questionnaire is a widely used data collection methodology, it is a written list of questions which answered by small or large numbers of respondents (Frankfort-Nachmias and Nachimas, 1992). The successful questionnaire survey depends significantly on the design of its content, so serious precautions must be taken while designing its content, structure and response format (Hoinville and Jowell, 1978).

3.6.2.1 Questionnaire Design

The questionnaire is the selected quantitative data collection tool; it was designed based on collected data from existing literatures on SCPM practices. The questionnaire started with a brief description of the study objectives, description of its parts, sections and sub-sections, and the expected time to complete it. The questionnaire consists of five major parts as follows:

- **First part** investigates general information, including the respondent work experience in construction field and the work position, organization place and type, the organization experience in construction field and the main specialization.

- **Second part** explores the implementation of SCPM practices; it is divided into four sections following the construction project management consecutive stages and each section is divided to three sub-sections concerning sustainability pillars (Economic, Social, and Environmental).

The first section explores implementation of sustainability practices in the inception & feasibility stage, the second section explores implementation of sustainability practices in the design stage, the third section explores implementation of sustainability practices in the tendering stage, and the final section explores implementation of sustainability practices in the construction stage.

- **Third part** is divided into two sections: the first section explores barriers to the implementation of SCPM**,** and the second section investigates the drivers of SCPM adoption in the Palestinian construction sector.

- **Fourth part** explores general factors affecting SCPM for the context of Palestinian construction sector.

- **Fifth part** represents the qualitative part of the questionnaire by giving respondents space to express their notes, comments, or any additional information concerning SCPM in Palestine.

3.6.2.2 Questionnaire Content Validation

Following the same way how the interview was validated, the proposed questionnaire was presented to the recommended academics (See Appendix C), and they were asked to comment on the questionnaire parts, sections, and sub-sections and indicate their opinion on the content appropriateness to measure the intended purpose of the study. In addition, they were asked to approve language, time, consistency, relevance, and the overall structure.

3.7 Data Analysis Approach

This section presents the selected analysis techniques to draw the results of the collected data, following the sequential mixed approach, which includes qualitative and quantitative data as mentioned and discussed before.

3.7.1 Interview Analysis

As discussed before, the qualitative data of the study was collected using the semi-structure interview process with eleven academics and field experts who are familiar with construction project management and sustainability knowledge. The collected qualitative data was handled and analyzed following the "Thematic Analysis" approach.

"Thematic analysis" is an accessible and flexible qualitative data analysis methodology; it organizes the qualitative data set into identified pattern of meanings (themes) (Clarke and Braun, 2014). It demonstrates which themes are essential in reflecting and describing the phenomenon under study (Daly et al., 1997). Verbal interviews and textual newspaper data are considered the most appropriate kinds of data whom should be thematically analyzed (Harper and Thompson, 2011). Thematic analysis procedure is summarized by Clarke and Braun, (2014) in six consecutive phases as follow:

1. Familiarizing yourself with your data: the first step is transcribing the collected data, read it carefully, and writing the initial ideas.

2. Generating initial codes: the second step is coding the interesting features of collected data, and collecting relevant data for each code.

3. Searching for themes: the third step is combining codes into potential themes, and gathering data relevant for each theme.

4. Reviewing themes: the fourth step is checking themes in relation to codes and the entire data set, and drawing the thematic map for analysis.

5. Defining and naming themes: the fifth step is the analysis of each theme specifics, and the overall story the theme tells, and generating names and definitions for each theme.

6. Producing the report: the final step in thematic analysis is final analysis of the vivid and compelling extracts, relating the analysis to the research questions and literature, producing the scholarly report of analysis.

3.7.2 Questionnaire Analysis

The conceptual analytical model of the research suggests number of relations between sustainability practices in CPM stages and the construction projects management performance. As discussed in the introduction, the objectives and the hypothesis of the study is concentrated on exploring the relations between such sustainability practices and the SCPM performance by following the mixed analytical approach. According to Ullman and Bentler (2003), the Structural Equation Modeling (SEM) is the appropriate method for conducting both confirmatory and exploratory

researches. SEM is an effective second-generation multivariate analysis method for complex structural paths and measurement models with multiple latent variables and levels of constructs (Williams et al., 2009; Astrachan et al., 2014). In addition, SEM is utilized for either confirm prior established theories "confirmatory studies", or identify relations between variables and data patterns "exploratory studies" (Hair et al., 2016). Moreover, SEM has significantly utilized in management field in the past decade (Xiong et al., 2015).

3.7.2.1 Partial Least Squares Structural Equation Modeling (PLS-SEM)

According to Hair et al. (2016), SEM has two types: the first is the covariance-based SEM (CB-SEM), and the second type is the variance-based partial least square-SEM (PLS-SEM). CB-SEM is utilized to reject or confirm theories when relation between variables are tested empirically, while the PLS-SEM is used in exploratory researches to develop theories (Hair et al., 2012).

Hair et al. (2011) presented a rule of thumb that can be utilized when deciding whether to use CB-SEM or PLS-SEM, these rules of thumps are summarized in Table 7.

Table 7: Rules of Thumb for Selecting CB-SEM or PLS-SEM.

Decision considerations	**When to use PLS-SEM**	**When to use CB-SEM**
Research Goals	Research is exploratory Predicting key driver constructs	Theory testing and confirmation
Model Specifications	Formative constructs are parts of the structural model Structural model is "complex"	model is nonrecursive
Data Characteristics	Small sample size Normality is not requested	Needs large sample size
Model evaluation	subsequent analyses for the latent variable	When global goodness-of-fit model is required need to test for measurement model invariance

Hair et al. (2016) recommended the selection of the PLS-SEM over CB-SEM, because of its ability to obtain solutions in any situation, especially with small sample size, complex models with large number of indicators as well as several exogenous and endogenous constructs, hypothesis is less created, and non-normal data distribution. In addition, PLS-SEM combines explanation and prediction perspectives to model estimation. Therefore, in this study, the collected quantitative data was analyzed by using the PLS-SEM approach.

Chapter Four

Data Analysis and Results

4.1 Chapter Overview

This chapter presents the results of the qualitative and quantitative data analysis. Data in this study were analyzed following two approaches; the first one was the thematic analysis approach for analyzing qualitative data, which was collected via interviewing experts. The second data analysis approach was the Partial Least Squares-SEM for analyzing the quantitative data and testing hypothesis.

4.2 Interview Analysis

As demonstrated in the research methodology, the research utilized the qualitative data collection approach “semi-structured interviews” in order to discuss the real situation of SCPM in the West Bank/ Palestine. Eleven interviews were held with variety of experts and academics who are familiar and sufficiently experienced in sustainability concepts, sustainable development concepts, and the construction project management field as shown in Table 8.

Table 8: Profile of Interview Participants.

No.	Role	Years of Experience	Institution
Interviewee 1	General Manager	24	Government
Interviewee 2	Institution Manager	13	NGO
Interviewee 3	General Manager	16	NGO
Interviewee 4	General Manager	7	Engineering Office
Interviewee 5	General Manager	11	Engineering Office
Interviewee 6	General Manager	17	Engineering Office
Interviewee 7	Manager	8	Engineers Association
Interviewee 8	General Manager	22	Government
Interviewee 9	Academic lecturer	11	University
Interviewee 10	Academic lecturer	24	University
Interviewee 11	Manager	16	Government

The interview started with verbal description of the research topic and the research objectives, in addition to a brief summary of sustainability, and sustainable project management definitions in reference to Silvius and Schipper (2014); to insure the consistency of interviewee's responses. In addition, it was made clear for the interviewees that the semi-structured interview will take around 30 minutes, all personnel information will be treated with high level of confidentiality, all gathered data will be used only for scientific research objectives, then the interview was proceeded as shown in Appendix (D).

As discussed before, the researcher handled and analyzed collected qualitative data by following the thematic analysis procedure by Clarke and Braun (2014). As a result, the interested features of collected data were coded under different issues, and then, the researcher combined the codes under the potential themes as shown in Table 9. All interviewees agreed on

sustainability requirements adoption in the CPM practices alongside the project iron triangle (time, cost and scope).

Table 9: Themes, Categories and Codes Discussed.

Codes	Issue(s) discussed	Themes
Location analysis	Economic Inception	Economic SCPM Practices
Consulting contractors		
Consulting Suppliers		
Use existing Infrastructures		
Traffic Plan	Economic Design	
Durable material		
Local Material use		
Flexible working location		
Tender technical evaluation	Economic Tendering	
Tender financial evaluation		
Local Employment	Economic Implementation	
modern construction technology		
Society Participation	Social Inception	Social SCPM Practices
Local Acceptance		
Flexible working time	Social Design	
Workers Training	Social Implementation	
PMT training		
Carbon emissions	Environmental Design	Environmental SCPM Practices
Renewable material		
Green areas		
Materials recycling	Environmental Implementation	
Special smoking areas		
Dust control		
Supply Plan	Environmental Inception	
Environmental Impact Assessment		
Electronic Tendering	Environmental Tendering	
Less Knowledge	Ability limitations	Barriers to SCPM
Economic situation		
Recycling abilities		
Tender selection criteria	Technical criteria	
Occupation	Control resources	
Financial Incentives	Governmental Support	Drivers of SCPM
Decision maker support		
Tax reduction		
Taxes on nonrenewable resources		
Non-Compliance penalties		
University courses	Sustainability Knowledge	

4.2.1 Theme 1: Economic SCPM Practices

This theme discusses and analyzes the economic sustainability pillar. The interviewees insured the importance of considering economic sustainability practices through all the CPM stages, i.e. inception, design, tendering, and implementation stage.

First, interviewees discussed the need for site analysis in the project inception and feasibility stage, for example, analyzing the ability of exploiting the existing infrastructure in the project place could decrease costs from 30-40%. In addition, contractors and suppliers consulting and participation during the inception stage is very important, since that would decrease costs by releasing the vagueness in the project specifications and requirements and it will insure the availability of needed resources which in turn will save time and cost.

Second, in the project design stage, interviewees insisted on the importance of designing a traffic plan in order to reduce transportation as much as possible, and utilizing local durable material. They also suggested adoption of flexible working place technique, this will save time and money due to less transportation time and offices needed.

Third, in the tendering stage interviewee, especially those who are working in engineering offices insured the need for differentiating between the financial evaluation and the technical evaluation of tenders in the

Palestinian CPM, since the selection of the lowest price might detract from the technical sustainability needs in the CP design specifications.

Finally, for practices affecting the economic implementation of the CP in Palestine, interviewees agreed on the local employment, which in turn would enrich the local economy. In addition, they pointed out on the importance of adopting modern construction techniques, which will save time and money.

4.2.2 Theme 2: Social SCPM Practices

Since interviewees agreed on the importance of sustainability requirements adoption in the Palestinian CPM. This theme is for analyzing social CPM practices that are practiced and should be more practiced by the construction sector in Palestine.

First, interviewees pointed out the significant rule of society participation in the inception stage, this practice will insure the local acceptance and the survival of the project through all its management stages.

Second, in the project design stage, interviewees suggested the need for shifting from restricted working time in to flexibility in working time and evaluation in reference to the employee achievements and effectiveness, which would increase the employee satisfaction and save their time.

Finally, in the CP implementation stage, according to the interviewees, one of the most important needed practices in order to integrate sustainability in

CPM in Palestine is providing training courses on sustainability practices and requirements for workers and the PMT.

4.2.3 Theme 3: Environmental SCPM Practices

This theme is for analyzing environmental practices needed for sustainability integration in the Palestinian CPM. In the project inception stage, interviewees agreed on two crucial environmental practices for the Palestinian CPM, which are environmental impact assessment and supply plan with less transportation. During project design stage, interviewees highlighted three environmental practices, which are selecting renewable materials, considering carbon emissions, and designing for green areas.

In the project tendering stage, a number of interviewees suggested the transition from hardware tendering document to software utilization tendering process with less paper works. Finally, in the project implementation stage, the most mentioned environmental practices were dust control, due to its high impact on the surrounding environment, material reuse and recycling, and one of the interviewees suggested customizing special smoking places in the project site.

4.2.4 Theme 4: Barriers to SCPM

The researcher discussed with interviewees the barriers to the successful implementation of sustainability requirements in the Palestinian construction management sector. One of the most serious barriers that would obstruct sustainability implementation is the limited available

abilities, for example, the limited available knowledge and lessons learned on sustainability and its requirements. In addition, as discussed by interviewees, the modest Palestinian economic situation would affect the adoption of sustainability requirements as a priority in construction management, for example, there are no available enough recycling companies for recyclable materials generated in the construction site.

Another highlighted barrier to the implementation of SCPM, especially by those who are working in designing offices, is tendering selection criteria. They claimed that financial criteria is always preferred over the technical selection criteria, which would detract from the implementation of the required sustainability practices.

In addition, interviewees agreed on the colonial occupation as one of serious barriers to SCPM implementation in Palestine, due to the enormous control over the natural resource.

4.2.5 Theme 5: Drivers of SCPM

The last theme discusses key drivers for the successful implementation of SCPM in the Palestinian construction sector. Interviewees summarized drivers into two key categories, which are the governmental support and knowledge on sustainability. First, according to the interviewees consensus, the governmental support plays a serious role in SCPM adoption in the Palestinian construction sector; for example, the adoption of financial incentive technique due to sustainability implementation would encourage

its implementation, such like tax reduction on sustainability practices and sustainable material utilization and imposing taxes on nonrenewable resources use.

In addition, interviewees agreed that the Palestinian government should impose penalties for non-compliance with sustainability requirements, which save the natural environment and natural limited resources.

The second driver of sustainability in the Palestinian construction sector is sustainability knowledge, where interviewees agreed that there is an important need to integrate the existing sustainability knowledge in the construction management courses especially in the engineering departments in the Palestinian universities.

4.3 Survey Analysis

As discussed earlier, surveyed data were analyzed following the structural equation modeling (SEM) approach, by utilizing the partial least square SEM methodology. A prominent software for variance-based structural equation modeling (SEM) using the partial least squares (PLS) path modeling method is the “SmartPLS”, which was developed by Ringle et al. (2005). This research used SmartPLS version 3.2.7.

4.3.1 Descriptive Statistics of Respondents

The survey was distributed to a verity of institutions in the West Bank who are involved in the whole CPM process starting from the inception stage

until delivering the project output (refer to Appendix F). Those institutions include; engineering offices classified as consultant offices, governmental institutions, and NGOs who participate in construction field, and large contracting companies. The total number of distributed surveys via email are 237 questionnaires, several institutions responded that they don't have sufficient knowledge or experience on sustainability and sustainable construction requirements, so they didn't fill the questionnaire. The number of valid surveys, which were properly completed, was only 73 surveys with a response rate of 30.8 %.

4.3.1.1 Respondents Job Position

To insure the collection of valuable data from respondents in the different organization types, top management was targeted, since this segment is accountable for project management practices and decision making in the organization. As shown in Figure 8, the chief executive officers (CEO) are the highest present of contributors in this study with 36%, followed by the general managers with 33%.

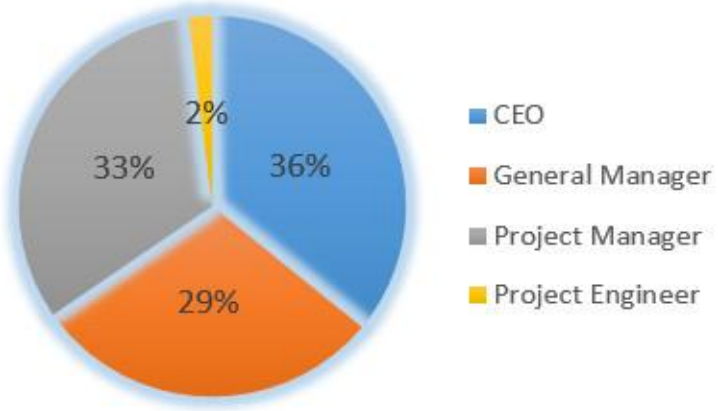

Figure 8: Respondents Job Title Distribution.

4.3.1.2 Respondents Level of Experience

Respondents experience level was divided into four categories in relevance to the number of years in practicing CPM. Since the highest percent of respondents were CEOs and General Managers, it is normal that most of respondents have more than 11 years of experience followed by experience level from 6 to 10 years as shown in Figure 9.

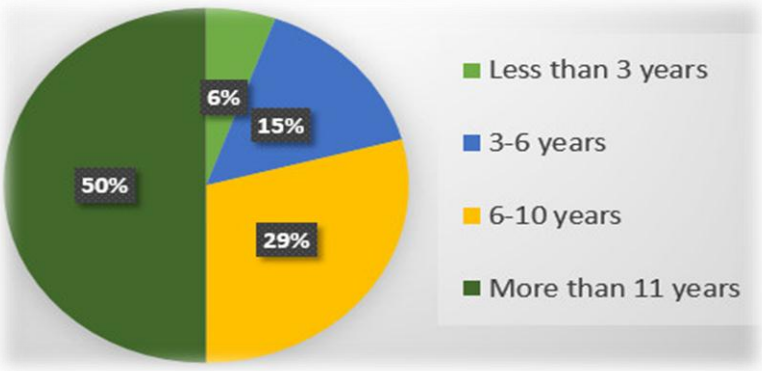

Figure 9: Respondents Experience Distribution.

4.3.1.3 Organizations Type

As discussed earlier, the research sample includes all organizations, which are involved in the whole CPM practices starting with inception stage until implementation of the project. Therefore, engineering offices were the highest participants with 39%, followed with non-governmental organizations, which implement construction projects, and municipalities with 17% and 16% respectively as shown in Figure 10. The contracting organizations constitute only 12% of respondents, because only large contracting institutions were included in the study sample, those who participate in a consultancy part in projects feasibility studies.

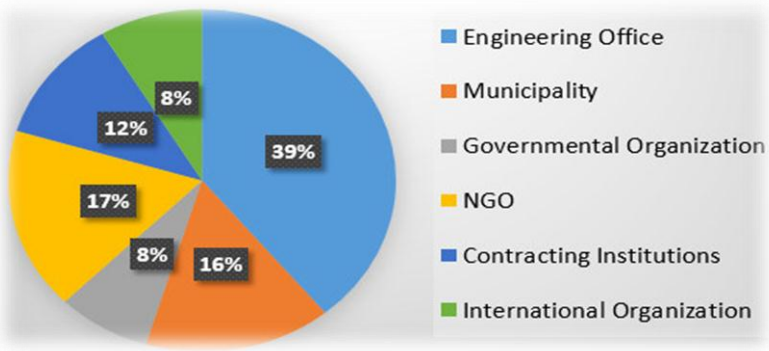

Figure 10: Organizations Type Distribution.

4.3.1.4 Organization Level of Experience

Within each organization type, only highly ranked organizations were involved in the study sample. For example, for engineering offices, only consultant and first-degree ranked offices were included, and only first-degree contracting institution took a part in this research. Therefore, as

prominent in Figure 11 the majority of participated organizations have more than 11 years of experience in CPM.

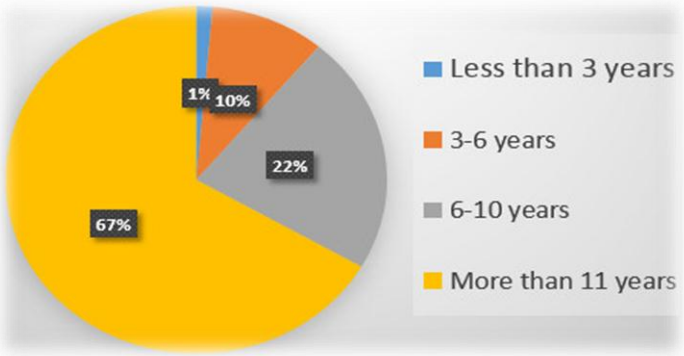

Figure 11: Organizations Experience Distribution.

4.3.1.5 Organizations Geographical Distribution

The research sample included organizations from most of West Bank cities but with different participations levels. For example, organizations, which are located in Ramallah, scored the highest participation level with 28%, followed by Hebron with 20% and Nablus with 11% as demonstrated in Figure 12.

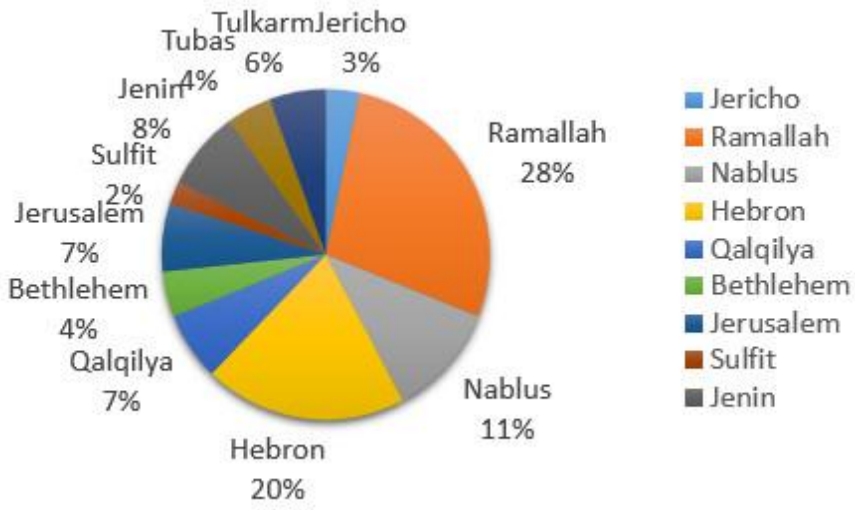

Figure 12: Organizations Spatial Distribution.

4.3.2 SCPM Practices Assessment

As discussed earlier, one of the research objectives is to examine what are the key practices affecting successful implementation of sustainability in CPM in the West Bank. Therefore, respondents were asked to indicate their organization's level of implementation of each sustainability practices within each CPM stage (inception, design, tendering, and implementation stage). Each CPM stage was divided into three sections following the sustainability pillars; economic, social, and environmental sustainability. The respondents indicated their level of implementation of each practice following a five-point Likert-scale: where one stands for "never implemented", two stands for "seldom implementation", three stands for "sometimes implemented", four stands for "often implemented", and five stands for "always implemented". Now, the mean of responses was analyzed to decide what are the SCPM practices implemented in the West Bank, and to what extent. As shown in Table 10, in the five-point Likert-

scale “one and five”, the range value between the upper and lower limits is 0.8 (Wu and Leung, 2017).

Table 10: Level of Implementation Scale.

Mean	Level of Implementation
1-1.79	never implemented
1.8-2.59	seldom implemented
2.6-3.39	sometimes implemented
3.4-4.19	often implemented
4.2-5	always implemented

4.3.2.1 Sustainable Project Inception Practices

The means and the standard deviations of sustainability practices during the first stage of CPM (Inception), are presented in Table 11, and the level of implementation of each practice is discussed.

Table 11: Project Sustainable Inception Practices Means and Standard Deviations.

Economic Sustainability Practices		**Mean**	**standard Deviation**	**Implementation level**
1	Assessing people needs	4.056	0.78	Often implemented
2	Shifting from analysis short term cost and return on investment to long term gains from operational savings	3.639	0.871	Often implemented
3	Studying the project effect on local economy, such like local employment and local material consumption.	4.167	0.816	Often implemented
4	Considering the impact on tourism value	3.389	1.048	Sometimes implemented
5	Finalize economic and ecological goals based on cost/benefit analysis	3.833	0.866	Often implemented
Overall		3.8168		Often implemented
Social Sustainability Practices				
1	Considering the impact on society culture.	3.833	0.745	Often implemented
2	Include key external stakeholders and Community representatives, and insure	4.083	0.777	Often implemented

	public acceptance toward the project.			
3	Include diverse representation from the project team functions.	4.278	0.803	always implemented
4	Improving welfare and provision of amenities for the local community.	3.958	0.92	Often implemented
5	Improve the local infrastructure capacity.	4	0.928	Often implemented
6	Select site based on stakeholder involvement including community input.	4.139	0.822	Often implemented
Overall		4.048		Often implemented
Environmental Sustainability Practices				
1	Include Environmental goals.	3.625	0.873	Often implemented
2	Considering the Eco-environmental sensitivity of the project location.	3.375	1.006	Sometimes implemented
3	Examining the project associated potential ecological risks and benefits.	3.75	0.862	Often implemented
4	Studying the potential air, water and noise pollution from the project through construction and post-construction stages.	3.667	0.957	Often implemented
5	Consult sustainability expert during project feasibility study.	2.75	1.21	Sometimes implemented
Overall		3.433		Often implemented

Most of the economic sustainable project inception practices are often implemented in the West Bank construction sector, and the social sustainability practices are also often implemented, except the inclusion of diverse representatives from the project team functions during inception stage is always practiced. For the environmental sustainability practices, most of them are often implemented, except the consideration of the eco-environmental sensitivity of the project location is less practiced.

4.3.2.2 Sustainable Project Design Practices

Table 12 shows the implementation level of each sustainable project design practices based on the analyzed means and standard deviations in reference to surveyed responses.

Table 12: Project Sustainable Design Practices Means and Standard Deviations.

	Economic Sustainability Practices	Mean	standard Deviation	Implementation level
1	Considering the availability of needed resources (material, machinery, etc.).	4.347	0.627	always implemented
2	Selection of durable, reusable, maintainable, and recycled material.	3.653	0.96	Often implemented
3	Employing realistic cost and time estimates.	4.278	0.803	always implemented
4	Compliance with legal requirements.	4.514	0.577	always implemented
5	Standard dimensions in design specifications.	4.528	0.577	always implemented
Overall		4.264		always implemented
1	Designing an effective health and safety protocols	4.264	0.866	always implemented
2	Communication with and participation of all stakeholders during project design.	4.347	0.627	always implemented
3	Design for emergencies, such like earthquakes, fire, flooding etc.	4.264	0.866	always implemented
4	Get feedback from local government planners and other regulatory agencies in the early stages to ensure compliance with local, state and federal guidelines.	4.333	0.745	always implemented
Overall		4.302		always implemented
Environmental Sustainability Practices				
1	Pay attention for the environmental impact of selected materials.	3.833	0.745	Often implemented
2	Employ the use of standardized components to improve build ability and reduce waste generation.	3.75	0.862	Often implemented
3	Considering environmental requirements in the project design.	3.931	0.805	Often implemented
4	Flexibility in working time and place for the designing team.	3.389	1.048	Sometimes implemented
Overall		3.725		Often implemented

During the construction project design stage, most of the economic sustainable practices are always implemented in the Palestinian CPM sector, except the selection of durable, reusable, maintainable, and recycled material is often practiced. For the social sustainability, all the surveyed

project design practices are always implemented, but the environmental sustainability practices are less implemented than economic and social practices during the project design stage.

4.3.2.3 Sustainable Project Tendering Practices

Table 13 shows the level of implementation and the means of the surveyed project sustainable tendering practices.

Table 13: Project Sustainable Tendering Practices Means and Standard Deviations.

	Economic Sustainability Practices	Mean	standard Deviation	Implementation level
1	Comprehensive contract and specifications documentation.	4.611	0.657	always implemented
2	Compliance with procurement law.	4.431	0.796	always implemented
3	Transparent procurement procedure.	4.736	0.527	always implemented
4	Contracts include performance agreements, incentives, and bonuses for implementing sustainable practices and exceeding sustainability goals.	3.375	1.006	Sometimes implemented
Overall		4.288		always implemented
Social Sustainability Practices				
1	Pre-tendering and tendering auditing and investigation.	4.431	0.796	always implemented
2	Preventing bribery and corruption.	4.736	0.527	always implemented
3	Fair competition	4.611	0.657	always implemented
Overall		4.592		always implemented
Environmental Sustainability Practices				
1	Selection criteria toward contractors, and investigate their level of awareness of sustainability principles and their previous records of sustainable projects implementation.	3.569	1.2	Often implemented
2	Less amount of paperwork.	3.569	1.176	Often implemented
3	Contracts should also include specific provisions for LEED points and agreements to return unused materials to vendors.	2.403	1.175	Seldom implemented
4	Dealing with companies to recycle materials such as iron and others during the implementation of the project.	4.542	1.05	always implemented
Overall		3.520		Often implemented

Respondents indicated a high level of compliance with procurement low, practicing transparent procurement procedure, and preparing a comprehensive contract and specifications documents, but the inclusion of performance agreements, incentives, and bonuses for implementing sustainable practices are less practiced by the Palestinian construction sector. For social sustainability, all the mentioned practices are always implemented. At the same time, the environmental project tendering practices are not implemented as much as the economic and the social practices, for example, Contracts usually do not include specific provisions for LEED points and agreements to return unused materials to vendors. However, the Selection criteria toward contractors are often considered, alongside the amount of paperwork, and most of respondents indicated a high level of dealing with companies to recycle materials.

4.3.2.4 Sustainable Project Implementation Practices

For project sustainable implementation practices in the West Bank, Table 14 indicates the level of application for each practice within the economic, social, and environmental sustainability pillars.

Table 14: Project Sustainable Implementation Practices Means and Standard Deviations.

Economic Sustainability Practices		**Mean**	**standard Deviation**	**Implementation level**
1	Compliance with the required specifications and quality level.	4.452	0.725	always implemented
2	High quality workmanship.	4.347	0.748	always implemented
3	Efficient resource allocation and reusability of molds, frameworks etc.	3.931	0.804	Often implemented
4	Use up to date and modern construction technology and methods for execution of works.	4.306	0.659	always implemented
5	Inspection and maintenance of construction equipment.	3.917	1.024	Often implemented
6	Insurance for construction site, workforces, and equipment.	4.452	0.725	always implemented
Overall		4.234		always implemented
Social Sustainability Practices				
1	Creation of constructive relationships and communication between project stakeholders.	4.389	0.657	always implemented
2	Select the project management team members based on competency and transparency	4.319	0.597	always implemented
3	Education on sustainability requirements for the project management team.	3.375	1.136	Sometimes implemented
4	Incentives and rewards for the project management team	3.056	1.091	Sometimes implemented
5	Health and safety at work	4.306	0.659	always implemented
6	Participation of all parties in project monitoring and decision-making	4.069	0.948	Often implemented
7	Promote community harmony within diverse project workforce	4.167	0.553	Often implemented
Overall		3.954		Often implemented
Environmental Sustainability Practices				
1	Amount of water consumption and reuse.	3.708	1.148	Often implemented
2	Extent of energy consumption and use of renewable energy sources	3.917	1.103	Often implemented
3	Managing hazardous materials (supply, use, and disposal)	3.431	1.003	Often implemented
4	Considering transportation effect (extent of blockage)	3.056	1.122	Sometimes implemented
5	Control noise and vibration	4.042	0.987	Often implemented
6	Construction waste management	3.361	0.981	Sometimes

	(recycling, reuse, and disposal routes)			implemented
7	Compliance with environmental protection laws and regulations	2.75	1.210	Sometimes implemented
8	Less amount of paperwork	4.319	0.758	always implemented
9	Involvement of environmental representative in the project management team	4.153	0.698	Often implemented
Overall		4.092		Often implemented

Respondents indicated a high level of application for the mentioned economic sustainability required practices. In addition, most of the social sustainability practices are always implemented, except the adaptation of an incentives and rewards system and education on sustainability requirements for the project management team. For the environmental sustainability, most of the surveyed practices are often implemented, except the Construction waste management and the compliance with environmental protection laws and regulations are less practiced.

4.3.3 Barriers and Drivers to SCPMP

Drivers and barriers to the implementation of SCPM were collected from the existing literature concerning adaptation of sustainability requirements in CPM process, then it were presented to the sample of respondents in the West Bank to indicated their level of agreement with each mentioned statement. Respondents expressed their level of agreement using a five-point Likert-scale, where “1” stood for strongly disagree, “2” for disagree, “3” for neither agree nor disagree, “4” for agree, and “5” for strongly agree.

4.3.3.1 Barriers to SCPMP

In line with what mentioned above, Table 15 presents means and standard deviations of respondent's level of agreement with each mentioned statement of barriers to SCPM, in addition ranks are added in an ascending manner starting from the highest agreement level to the lowest agreement level.

Table 15: Barriers to the Implementation of Sustainable Construction.

No.	Barriers to the implementation of Sustainable Construction	Mean	standard Deviation
1	Lack of knowledge and training about the concept of Sustainability	4.319	0.597
2	Lack of legal aspects concerning sustainability in construction management	4.153	0.544
3	Tendency to use traditional design and construction methods	3.986	0.785
4	Lack of information on sustainable construction issues and solutions	3.922	0.773
5	Lack of interest of stakeholders on sustainability Issues "Sustainability is not a priority"	4.389	0.657
6	Sustainability may increase in the construction cost on the short terms, and long pay back periods from sustainable practices	3.5	0.986

Respondents indicated a high level of agreement with collected barriers to the implementation of SCPM in the West Bank; all surveyed barriers scored means above or equal to "3.5". The top three barriers to the successful implementation of SCPM with highest agreement level are the lack of interest of stakeholders on sustainability Issues "Sustainability is not a priority", the lack of knowledge and training about the concept of Sustainability, and the lack of legal aspects concerning sustainability in construction management.

4.3.3.2 Drivers to SCPMP

Table 16 presents means and standard deviations of respondent's level of agreement with each mentioned statement of drivers to SCPM performance; in addition, ranks are added in an ascending manner starting from the highest agreement level to the lowest agreement level with each mentioned statement.

Table 16: Drivers to the Implementation of Sustainable Construction.

No.	Drivers to the implementation of Sustainable Construction.	Mean	standard Deviation
1	Tax reduction incentives related to investment effort in sustainable construction practices.	4.222	0.792
2	Energy and resource conservation	4.324	0.749
3	Governmental regulations and polices	4.167	0.692
4	Corporate reputation and image	4.295	0.687
5	Satisfaction of local community	3.917	0.777
6	Waste reduction	4.198	0.592
7	Environmental benefits	4.328	0.645
8	Improve water usage	4.282	0.583
9	Less rework and field adjustments	4.361	0.535

In addition, respondents indicated a high level of agreement with collected drivers to the implementation of SCPM in the West Bank; surveyed drivers scored means with higher level of agreement than barriers; where means were equal to or above "3.917". The top three drivers to the successful implementation of SCPM are the less rework and field adjustments due to implementation of sustainability requirements, the environmental benefits, and the opportunity to energy and resource conservations.

4.3.4 Evaluating Measurement and Structural Models

This section demonstrates the study model evaluation, which consists of the measurement model evaluation, and the structural model evaluation, in order to examine the appropriateness of the models in describing the effects between constructs under evaluation (Götz et al., 2010, P:693).

Model evaluation is necessary to insure the validity and reliability and the quality of the PLS estimators of the latent variables (Vinzi et al., 2010), therefore, the next two subsections show the examination of the utilized analysis methodology.

4.3.4.1 Measurement Model

As mentioned before, the measurement models specify the relation between variable and constructs, therefore, it is important to select suitable variables in order to operationalize the built construct (Wong, 2013). The measurement model can include either formative or reflective indicators, or both formative and reflective depending on the relation between indicators and construct, and the selection of the relation type depends on theoretical considerations (Fornell and Bookstein 1982, pp. 292–294).

In this research and in line with other similar researches, indicators as shown in Figure 13 reflect the constructs, and in order to evaluate any reflective measurement model internal consistency, indicator reliability, convergent validity and discriminant validity must be tested (Hair et al., 2014; Sarstedt et al., 2014; Hair et al., 2012a).

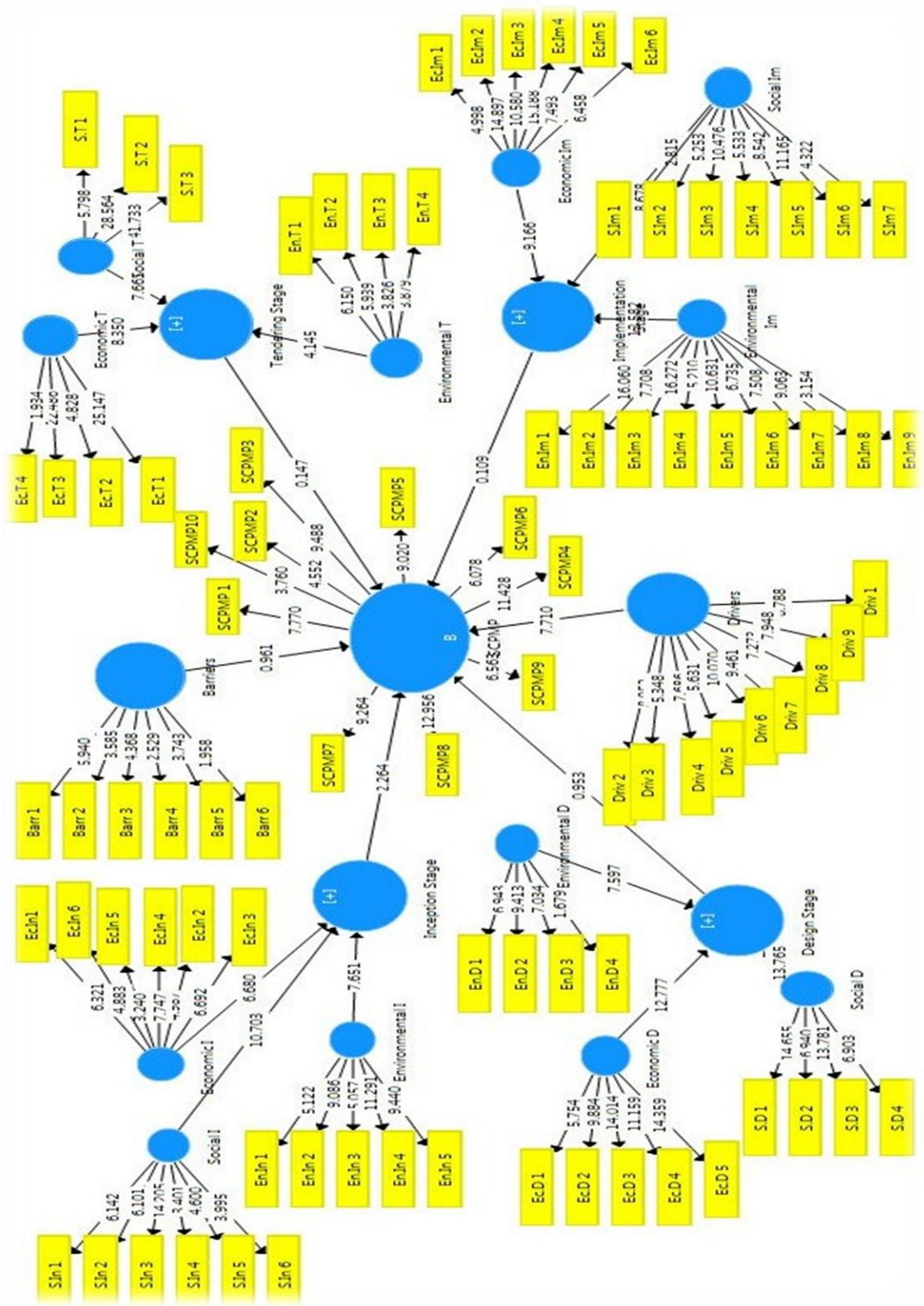

Figure 13: The analysis Model as Generated by SmartPLS (the demonstration of the results from the figure follows in the sequent sections).

4.3.4.1.1 Internal Consistency

Cronbach's Alpha is the traditional measurement for testing the measurement model internal consistency; then, literature suggested the Composite Reliability as a replacement (Hair et al., 2012). According to Bagozzi and Yi (1988), for exploratory researches the composite reliability should be **0.6** or higher to ensure reliable internal consistent measurement model, i.e. measures (constructs) inside the construct have a similar range and significance.

In this research, Chronbach's alpha and composite reliability values were calculated using SmartPLS 3 software. As shown in Table 17, all constructs in the study measurement model scored an acceptable level of internal consistency reliability.

Table 17: Cronbach's Alpha and Composite Reliability Values.

Construct	Cronbach's Alpha	Composite Reliability	Status
SCPMP	0.901	0.919	**Accepted**
Inception Stage	0.840	0.870	**Accepted**
Design Stage	0.864	0.890	**Accepted**
Tendering Stage	0.821	0.860	**Accepted**
Implementation Stage	0.903	0.916	**Accepted**
Barriers	0.731	0.759	**Accepted**
Drivers	0.814	0.858	**Accepted**

4.3.4.1.2 Indicator Reliability

The reliability of indicators (IR) reflects how much the variation in an item is explained by the construct and is referred to as the variance extracted from the item, in another words, it is the square of a standardized indicator's outer loading (Hair et al., 2014).

According to Hulland (1999), IR should be higher than 0.7, but in exploratory researches 0.4 IR or higher is accepted. Since this study is an exploratory research, 0.4 and higher values of IR is accepted, and as shown in Table 18 all indicators scored higher than 0.4 IR values using SmartPLS 3 software, so all values are accepted.

Table 18: Individual Indicators Reliability (Factor loading).

Inception & feasibility stage					
Economic Practices		**Social Practices**		**Environmental Practices**	
Ec.In 1	**0.705**	S.In 1	**0.732**	En.In 1	**0.703**
Ec.In 2	**0.771**	S.In 2	**0.724**	En.In 2	**0.745**
Ec.In 3	**0.764**	S.In 3	**0.785**	En.In 3	**0.719**
Ec.In 4	**0.707**	S.In 4	**0.716**	En.In 4	**0.755**
Ec.In 5	**0.624**	S.In 5	**0.719**	En.In 5	**0.706**
		S.In 6	**0.589**		
Design stage					
Economic Practices		**Social Practices**		**Environmental Practices**	
Ec.D 1	**0.590**	S.D 1	**0.800**	En.D 1	**0.732**
Ec.D 2	**0.706**	S.D 2	**0.751**	En.D 2	**0.728**
Ec.D 3	**0.779**	S.D 3	**0.754**	En.D 3	**0.766**
Ec.D 4	**0.720**	S.D 4	**0.796**	En.D 4	**0.730**
Ec.D 5	**0.772**				
Tendering stage					
Economic Practices		**Economic Practices**		**Economic Practices**	
Ec.T 1	**0.882**	S.T 1	**0.712**	En.T 1	**0.743**
Ec.T 2	**0.778**	S.T 2	**0.889**	En.T 2	**0.736**
Ec.T 3	**0.871**	S.T 3	**0.907**	En.T 3	**0.827**
Ec.T 4	**0.727**			En.T 4	**0.827**
Implementation stage					
Economic Practices		**Economic Practices**		**Economic Practices**	
Ec.Im 1	**0.752**	S.Im 1	**0.722**	En.Im 1	**0.775**

Ec.Im 2	**0.789**	S.Im 2	**0.750**	En.Im 2	**0.670**
Ec.Im 3	**0.750**	S.Im 3	**0.711**	En.Im 3	**0.781**
Ec.Im 4	**0.792**	S.Im 4	**0.723**	En.Im 4	**0.701**
Ec.Im 5	**0.657**	S.Im 5	**0.683**	En.Im 5	**0.733**
Ec.Im 6	**0.785**	S.Im 6	**0.726**	En.Im 6	**0.656**
		S.Im 7	**0.789**	En.Im 7	**0.772**
				En.Im 8	**0.714**
				En.Im 9	**0.764**
SCPMP Practices		**Drivers to SCPMP**		**Barriers to SCPMP**	
SCPMP 1	**0.728**	Driv 1	**0.723**	Barr 1	**0.757**
SCPMP 2	**0.713**	Driv 2	**0.706**	Barr 2	**0.707**
SCPMP 3	**0.743**	Driv 3	**0.575**	Barr 3	**0.753**
SCPMP 4	**0.822**	Driv 4	**0.721**	Barr 4	**0.731**
SCPMP 5	**0.778**	Driv 5	**0.717**	Barr 5	**0.743**
SCPMP 6	**0.765**	Driv 6	**0.677**	Barr 6	**0.709**
SCPMP 7	**0.819**	Driv 7	**0.745**		
SCPMP 8	**0.813**	Driv 8	**0.712**		
SCPMP 9	**0.602**	Driv 9	**0.616**		
SCPMP 10	**0.576**				

4.3.4.1.3 Convergent Validity

Convergent validity (CV) measures the extent to which an indicator correlates positively with the other indicators in the same construct (Wong, 2013). In the reflective measurement models, indicators are treated as different approaches to measure the same construct, so these indicators converge or share a high proportion of variance. Therefore, in order to measure CV, researchers should consider the outer loadings of the indicators and the average variance extracted (AVE) (Hair et al., 2014).

The average variance extracted **(AVE)** measures the amount of variance that is captured by a construct in relation to the amount of variance due to measurement error Fornell and Larcker, 1981). According to Bagozzi and Yi (1988), the AVE should be 0.5 or higher. In this research, the AVE was calculated using SmartPLS 3 software, and as shown in Table 19, all constructs scored AVE values higher than 0.5.

Table 19: Average Variance Extracted.

Construct	Average Variance Extracted (AVE)	Status
SCPMP	0.552	**Accepted**
Inception Stage	0.587	**Accepted**
Design Stage	0.594	**Accepted**
Tendering Stage	0.637	**Accepted**
Implementation Stage	0.641	**Accepted**
Barriers	0.552	**Accepted**
Drivers	0.704	**Accepted**

4.3.4.1.4 Discriminant Validity

Discriminant Validity (DV) refers to the degree to which indicators differentiate among the construct, i.e. it measures the correlations between the variables of potential overlapping constructs (Wong, 2013). Unlike the CV, the DV deals with indicators separately and it measures how distinct is the construct from the other constructs by empirical standards (Hair et al., 2014).

Researchers use two measures of DV, the first one is the Cross-loadings, which compare the indicators outer loading on its associated construct to be greater than its outer loadings on other constructs (Hair et al., 2014). In other words, the loading of an indicator on its assigned latent variable

should be higher than its loading on all other latent variable (Chin, 2000). In this research, cross-loading values were calculated using SmartPLS 3 software as shown in Table (H1) in Appendix (H), and all indicators scored higher loadings on its assigned constructs than on the other constructs.

The second measure of assessing the discriminant validity is the Fornell-Larcker (1981) criterion, where it compares the square root of the AVE values with the latent variable correlations (Chin, 2010). Fornell and Larcker (1981) suggest that the "square root" of Average variance extracted (AVE) of each latent variable should be greater than the correlations among the latent variables, in other words, the latent variable should explain better the variance of its own indicators than the variance of other latent variables. Table (H2) in Appendix (H) shows the results of the test using the SmartPLS 3 software, an all constructs reflected square root of AVE with itself higher than with the other constructs.

4.3.4.2 Structural Model

The structural model describes the relation between the latent constructs (variables), it also called the inner model, which consists of exogenous variables, that refers to latent constructs that do not have any structural path relationships pointing at them, and the endogenous variables, which are the latent constructs that are explained by other constructs (Hair et al., 2011).

In order to evaluate the validity of the hypothesized relations inside the structural model, the following criteria facilitate the model assessment: coefficient of determination (R2), effect size (f2), path coefficients, and the predictive relevance (Q2) (Hair et al., 2014).

4.3.4.2.1 Model Fit

Model fit is tested to recognize how fit is the empirical data with the hypothesized model structure and so, it enables identifying the model misspecifications (Hair et al., 2016). One of the suitable indices for testing PLS-SEM model fit is the standardized root mean square residual (SRMR), in reference to Henseler et al. (2015), the SRMR is root mean square discrepancy between the observed correlations and the model-implied correlations. As per Hu and Bentler (1999) the model is classified as fir when SRMR is less than 0.1. Now for this study, and by using SmartPLS 3, the SRMR value is 0.0972, so the model is fit.

Another model fit criterion is the Normed fit index (NFI) by Bentler and Bonett (1980), the NFI measures the Chi-square value of the model and compares it against a meaningful benchmark. NFI acceptable value ranges between 0 and 1, and the higher value within the same range the better model fit (Lohmöller, 1988). Table 20 shows Chi-square value for the study model generated by SmartPLS 3 software.

Table 20: NFI Values.

	Saturated Model	Estimated Model
NFI	0.409	0.395

The next chapter discusses the analysis results and findings of the study more extensively.

4.3.4.2.2 Coefficient of Determination (R2)

R^2 reflects the proportion of the variance in the dependent variable that is predictable from the independent variables i.e., the combined effects on endogenous variables by the exogenous variables. In other words, it measures the model predictive accuracy (Hair et al., 2014). R^2 value ranges from zero to one and the accepted level of R^2 value depends on the research context (Falk and Miller, 1992). As per Henseler and Sarstedt (2013), the rule of thumb for R^2 acceptance is as follow: 0.75 value represents substantial predictive accuracy, 0.5 value represents moderate predictive accuracy, while 0.25 value represents weak predictive accuracy.

Table 21: R square Values.

Variable	R square	Decision
SCPMP	0.801	**Substantial**
Inception stage	0.922	**Substantial**
Design stage	0.723	**Substantial**
Tendering stage	0.675	**Moderate**
Implementation stage	0.917	**Substantial**

As shown in Table 21 above, and by using the SmartPLS 3 software, R^2 values indicated a substantial relationship of the endogenous latent variable's, since all values are above 0.5, and so, the proposed research

model reflects a substantial predictive relation between independent and dependent constructs.

4.3.4.2.3 The Effect Size (f^2)

The effect size measures the relative effect of a particular exogenous latent variable on the endogenous latent variable(s) by means of changes in the R-squared (Selya et al., 2012). In other words, the f^2 is measured by computing the change in R^2 when a specific variable is eliminated from the model (Hair et al., 2014).

In reference to Chohen (1988), f^2 values equal to 0.35 or higher is a large effect size, f^2 value ranges from 0.15 and 0.35 is a medium effect size, f^2 value ranges from 0.02 and 0.15 is a small effect size, while f^2 values less than 0.02 is considered with no effect size.

Table 22: F-squared Values.

	SCPMP
Inception-Stage	0.622
Design-Stage	0.547
Tendering-Stage	0.029
Implementation-Stage	0.322
Barriers	0.107
Drivers	0.774

Table 22 above present f^2values for this study, calculated by utilizing SmartPLS 3 software. Inception, design, and implementation stages demonstrated strong relations with the SCPM performance, while the tendering stage reflected a moderate relation. The explored drivers have a

strong relation with SCPM performance, but barriers to SCPMP reflected small effect size.

4.3.4.2.4 Path Coefficients (P-values)

The path coefficients are the regression coefficients, which measure the strength of the connections between the hypothesized relationships linking the variables in the study inner model (Wong, 2013). Path coefficient has standardized values, which range from -1 and +1, where values close to -1 indicate a strong negative relation, while values close to +1 indicate a strong positive relation, and the closer the estimated coefficients are to 0, the weaker are the relationships. (Hair et al. 2014).

After testing the strength of the relations between the independent and dependent constructs, it's important to assess the significance level of such relations. The bootstrap standard error enables computing the empirical t-values and p-values for all structural path coefficients (Lowry and Gaskin, 2014).

According to Greenland et al. (2016), P-values ranging from 0.05 to 0.01 presents a significant relationship, and P-values less than 0.01 presents a strong significant relationship. Table 23 present the path coefficients, standard Beta, sample mean and standard deviation values generated by SmartPLS 3 software. All hypothesized connections reflected a significant level of relation between variables.

Table 23: Path Coefficients of Research Hypotheses.

Relation	Standard Beta	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Value	Decision
Inception Stage -> SCPMP	0.308	0.302	0.112	2.81	0.006	**Supported**
Design Stage -> SCPMP	0.076	0.054	0.108	5.221	0.000	**Supported**
Tendering Stage -> SCPMP	0.17	0.173	0.066	6.410	0.000	**Supported**
Implementation Stage ->SCPMP	0.129	0.124	0.113	2.48	0.017	**Supported**
Drivers -> SCPMP	0.591	0.593	0.073	8.145	0.000	**Supported**

As mentioned, the path coefficients measures between the latent variables are tested in order to check the validity of the proposed hypothesis within the model (Hair et al., 2016). Table 24 below shows the tested research hypothesis.

Table 24: Study Hypotheses.

No	Hypothesis	Result
H1	The Implementation of sustainable **project inception practices** has a positive effect on the SCPMP in the West Bank.	**Supported**
H2	The Implementation of sustainable **project design practices** has a positive effect on the **SCPMP** in the West Bank.	**Supported**
H3	The Implementation of sustainable **project tendering practices** has a positive effect on the **SCPMP** in the West Bank.	**Supported**
H4	The Implementation of sustainable **project implementation practices** has a positive effect on the **SCPMP** in the West Bank.	**Supported**
H5	**Drivers** of SCPM have a positive effect on **SCPMP** in the West Bank.	**Supported**

In line with previous studies concerning sustainability in CPM, the implementation of sustainability practices in the CPM stages separately, has a positive effect on SCPM performance. In addition, drivers of sustainability have also a positive effect on SCPM performance.

4.3.4.2.5 Predictive Relevance (Q2)

The Stone–Geisser's Q^2 (Geisser, 1974), is the predominant measure of the predictive relevance (PR), the PR assesses the model ability in predicting the endogenous latent variables indicators. The blindfolding procedure is utilized to obtain the value of Q^2 (Henseler et al., 2016).

According to Chin (2010), the structural model has acceptable relevance when $Q^2>0$, otherwise, the model is unable to predict the endogenous latent

variables indicators. Table 25 shows the Q^2 values for endogenous constructs in this study by using SmartPLS 3 software.

Table 25: Construct Cross-Validated Redundancy.

Construct	SSO	SSE	Q^2 (=1-SSE/SSO)
SCPMP	720.000	478.999	0.335
Inception stage	1224.000	920.545	0.248
Design stage	936.000	606.959	0.352
Tendering stage	792.000	531.380	0.329
Implementation stage	1584.000	1104.592	0.303

Chapter Five

Results Discussion and Framework Development

5.1 Chapter Overview

This chapter extensively discusses results and findings obtained from data analysis as presented in Chapter Four. First, it demonstrates findings obtained from descriptive statistics, starting with the construction sustainable inception stage, then the design stage, tendering stage, and the sustainable construction implementation stage findings. In addition, drivers and barriers to SCPMP are discussed. Then it presents the research hypothesis testing results, and finally, the study SCPM framework is illustrated in details.

5.2 Discussion of the Survey and Interviews Findings

In this section, the surveyed data analysis results are discussed in a holistic manner, where findings in this research are compared and validated with the existing literature.

5.2.1 Descriptive Statistics Findings Discussion

Chapter 4 presented the surveyed extent of implementation of the construction sustainability practices. Such practices were analyzed following the consecutive CPM stages, and were classified under the triple sustainability pillars, i.e., economic, social, and environmental sustainability practices.

In other words, the descriptive statistics were utilized in this research in order to study and discuss the sustainable construction practices implemented and applicable in the Palestinian construction sector. The following sub-section extensively discusses these practices through the CPM life cycle.

5.2.1.1 Inception Stage Sustainability Practices

The level of implementation of the sustainability practices in the inception stage were surveyed as presented in Chapter 4. In order to address the research objectives, such practices are also demonstrated in light of the conducted interviews in addition to the reviewed literature in Chapter 2 as follows:

First, four of the economic sustainability practices were “often implemented”, and one practice was “sometimes implemented”, that indicate a moderate level of implementation of these practices in the inception stage. According to the interviewees, these practices are usually adopted when they have a direct economic benefit for the institution, otherwise, it should be mandatory in the project specification. The practices with the higher implementation level are:

“Assessing people needs”, this practice was ranked as often implemented according to the survey, and interviewees agreed that the expected benefits from the project outputs are linked to people acceptance and the local community needs. This is in line with Vanegaset al. (1995), who

emphasized that sustainability is based on human satisfaction, and the first step is identifying needs of people who are expected to use the project outputs.

“Studying the project effect on local economy, like local employment and local material consumption”. This practice is also ranked as “often implemented” by respondents to the survey, for interviewees, in order to consider the construction project as sustainable since the inception stage, it should enhance and support the local economy. Huovila and Koskela (1998) confirm that one of the common sustainability criteria is considering and enforcing the community economic situation.

Second, five out of six social practices are “often implemented” in the inception stage. In other words, respondents to the survey indicated that since the construction project inception stage they often consider the impact on culture, include external stakeholders, insure public acceptance, consider community welfare and provision of amenities, and consider the local infrastructure. The highest implemented social practice was “include diverse representation from the project team functions”, survey respondents ranked this practice as “always implemented”, which indicate that in the Palestinian construction field, institutions always insure the participation of diverse construction team members since the project inception stage. In this regard, interviewees added that in addition to the team representatives, the PMT should consult the contractors since the project inception; this would

investigate the constructability of the project and insure the existence of needed skills.

Finally, respondents ranked only three out of five environmental practices as “often implemented” in the project inception stage, and the remaining two practices were ranked as “sometimes implemented”, that indicates a moderate consideration level of environmental requirements during the project inception in the Palestinian construction sector. Interviewees agreed that the construction institution should prepare an Environmental Impact Assessment (EIA) during the project inception stage. This EIA should consider the environmental sensitivity of project location, the environmental risks and benefits, and the potential water, air, and noise pollution by the intended construction project. Moreover, Ding (2008) has concluded that it’s not enough to handle the project environmental sustainability by considering sustainability requirement during the design of the construction project or the management on site, instead, the environmental sustainability should be considered since early stages before any commitment is made to go ahead in project development.

5.2.1.2 Design Stage Sustainability Practices

The level of implementation of the sustainability practices in the design stage were surveyed as presented in Chapter 4. In order to address the research objectives, such practices are also demonstrated in light of the conducted interviews in addition to the reviewed literature in Chapter 2 as follows:

First, respondents indicated a high level of implementation of economic sustainability practices during the project design stage, four of the surveyed practices were ranked as “always implemented”, and only one practice was ranked as “often implemented”. That means that construction institution in the West Bank always consider the availability of needed resources, employing realistic cost and time estimates, comply with legal requirements, and utilize standard dimensions in design specifications.

Interviewees consented on the need for utilizing durable materials during the project design, taking the advantage of the existing infrastructures, adopting a flexible working location, and consulting the suppliers in order to ensure the availability of the required materials.

Second, all the surveyed social sustainability practices during the design stage were ranked as “always implemented”, that reflects a high level of implementation of social practices during design stage. In other words, construction institutions in the West Bank during the project design stage always design for emergencies, design health and safety protocols, communicate with stakeholders, and get feedback from local government planners and other regulatory agencies.

Finally, respondents ranked three out of four environmental sustainability practices as “often implemented” during project design, and one practice ranked as “sometimes implemented”, therefore, environmental practices are moderately implemented by construction institutions in the West Bank. In other words, construction firms and institutions in the West Bank during

project design phase often pay attention for the environmental impact of selected materials, utilize standardized components to improve build ability and reduce waste generation, and consider the environmental requirements, and they sometimes employ flexibility in working time and place for the designing team.

Interviewees commented that most of the respondents tend to over rank their sustainable performance, especially the private sector, those who often tend to reflect positive view of their institutions. As long as sustainability practices are not compulsory by the local government or project managing authorities, the private construction institutions usually follow sustainability needs when it reflects economic benefits to their firms or requested by the owners (Waddell, 2008; Rainsford, 2000).

5.2.1.3 Tendering Stage Sustainability Practices

The level of implementation of the sustainability practices in the Tendering stage were surveyed as presented in Chapter 4. In order to address the research objectives, such practices are also demonstrated in light of the conducted interviews in addition to the reviewed literature in Chapter 2 as follows:

First, respondents ranked three out of four economic sustainability practices as “always implemented” during the project tendering stage, and one practice was ranked as “sometimes implemented”, this indicates a relative high level of implementation for economic practices by

construction institution in the West Bank. Therefore, and in reference to the survey, construction institutions always prepare a comprehensive contract and specification documents, comply with procurement low, and follow a transparent procurement procedure, but they only sometimes include performance agreements, incentives, and bonuses for implementing sustainable practices in tendering contracts.

Second, all surveyed social sustainability practices were ranked as “always implemented”, i.e. respondents always audit and investigate tendering documents, ensure preventing bribery and corruption and follow a fair competition tendering process.

Finally, surveyed environmental sustainability practices in tendering stage reflected different level of implementation, institutions often consider the contractor level of sustainability principles awareness, and control the required amount of paper work, and always Deal with companies to recycle materials. Nevertheless, they rarely include specific provisions for LEED points and agreements to return unused materials to vendors.

Although, interviewees pointed that in the West Bank the financial selection criteria is considered more the technical criteria during construction project tendering stage, in addition, until now experience in sustainability issues is rarely requested, so that detracts from the SCPM performance.

5.2.1.4 Construction Stage Sustainability Practices

The level of implementation of the sustainability practices in the Construction stage were surveyed as presented in Chapter 4. In order to address the research objectives, such practices are also demonstrated in light of the conducted interviews in addition to the reviewed literature in Chapter 2 as follows:

First, respondents indicated a relative high level of implementation of economic sustainability practices during the construction project implementation stage. Four of the surveyed practices were ranked as "always implemented", and two practices were ranked as "often implemented" by responding construction institution. The highest implemented practices were insure the construction site, workforces, and equipment, compliance with the required specifications and quality level, and hiring high quality workmanship.

This is in consistence with interviewees opinions that construction institutions comply more with sustainability requirements when it return economic benefits to their firms. Wagner and Schaltegger (2003) confirmed this through studying the relation between firm economic success and sustainability performance with reference to Schaltegger and Synnestvedt (2002) model, where "traditionalist" argued that environmental protection practices would burden construction companies with additional costs. While in contrast, 'revisionist' presented sustainability performance as an opportunity for economic success, since

sustainability constitutes a competitive advantage for the construction company through improved productivity, efficient processes, and lower costs of compliance and new market opportunities (Sinclair-Desgagné, 1999)

Second, three out of seven social sustainability practices were ranked as "always implemented" by construction institution during the project construction stage, and two practices were ranked as "often implemented", and two practices were ranked as "sometimes implemented". This indicate a moderate level of social practice implementation during project execution by construction institutions in the West Bank. Construction institutions indicated that they always create constructive relationships and communication between project stakeholders, select the PMT members based on competency and transparency, and do care about health and safety at work. Interviewees agreed that the corporate social performance is part of its social responsibility, which should affect positively the firm view and reputation. Myers (2005) presented the corporate social responsibility (CSR) as the company's voluntary environmental, social and economic performance.

Finally, respondents reflected a moderate implementation level of environmental practices during the project construction stage. Five surveyed practices are "often implemented", and three practices are "sometimes implemented", and only one practice is "always implemented" by responding construction institutions.

5.2.1.5 SCPMP Barriers

Lack of stakeholders' interest on sustainability issues during the CPM stages was ranked as the first barrier for SCPM adapting in construction section in the West Bank, du Plessis (2002) confirmed this in the Agenda 21 for Sustainable Construction in Developing Countries. The second barrier is the lack of knowledge and training on sustainability concepts, also interviewees consented that the absence of lessons learned on construction management sustainability issues hinders the adoption of SCPM approach in the West Bank. Ahn et al. (2013) concluded that the lack on education on sustainability issues, lack of clients' interest on sustainability, and the lack of technical understanding are serious concerns associated with implementing sustainable construction practices.

Absence of legal aspects supporting sustainability integration in construction management was the third barrier for successful implementation of SCPM in the West Bank. According to the interviewees, the support of decision makers in the Palestinian authorities plays a significant role in the construction institutions commitment to SCPM requirements. Enforcement governmental regulations and policies are the major approach to protect the environment and society from the negative impact of construction activities (Gan et al., 2015).

The fourth ranked barrier to successful SCPM performance in the West Bank is the Tendency to utilize traditional design and construction methods. In this regards, Interviewees contensed on the need for new

construction technology which support sustainability. Du Plessis (2007) demonstrated that sustainable construction technology enablers fall into three areas. The first area is the hard technology that includes materials, equipment, processes, and infrastructure solutions. Second area is software technology, i.e. mental models and systems that support evaluation, monitoring and decision-making. The third area is information and knowledge on SCPM.

The least ranked two barriers to successful implementation of SCPM in the West Bank are: lack of information on sustainable construction issues and solutions, and "the increase in the construction cost on the short terms, and long pay back periods from sustainable practices". Although, several studies on sustainable construction presented the lack of sustainability knowledge, technical information, and awareness programs as a serious barrier to SCPM (Ametepey et al., 2015; Serpellet al., 2013; Zhou and Lowe, 2003). In addition, in spite of the investor's opinion on sustainability requirements costs as superfluous and unnecessary, it on the same time has significant economic benefits including the total cost savings, tax savings, added value, efficient resource use, improved productivity, and increased institution effectiveness (Zhou and Lowe, 2003).

5.2.1.6 SCPMP Drivers

The first ranked driver of SCPM implementation in the West Bank is "less rework and field adjustments"; this is in line with interviewees opinion, that construction institutions more commit to sustainability requirements

when it reflect economic benefits to their organizations, because less rework and field adjustments always mean save time and money. The second ranked driver is “Environmental benefits”, this is in contrast with interviewees point of view, that environmental sustainability requirements are achieved only when its mandatory, and enforced by legal legislations. Because the economic performance is the first priority of construction institution in the project feasibility study, and less attention is given to environmental and social needs (Shen et al., 2005).

“Energy and resource conservation”, “Improve water usage”, and “Waste reduction” were ranked as the third, fifth, and seventh derivers of SCPM in West Bank. Jaillon et al. (2009) confirmed these drivers as major factors in SCPM. Pitt et al. (2009) argued that sustainability integration in construction projects has great benefits, such like effective resource utilization, natural resource conservation, and enhancing the construction wastes management.

Construction institutions selected “Corporate reputation and image” as the fourth driver of SCPM in the West Bank, interviewees have also confirmed that the institution sustainable performance is considered as a competitive advantage in the construction sector. In addition, literature supported that the corporate environmental responsibility enhances its competitiveness and improves its reputation, as a result, it become more preferred as partner, supplier, or employer (Heikkurinen, 2010).

The sixth ranked SCPM driver is “Tax reduction incentives related to investment effort in sustainable construction practices”, interviewees strongly supported this driver, since they agreed that financial incentives and tax reduction due to sustainability implementation would be a successful strategy for integrating SCPM in the construction sector. At the same time, they suggested that government should impose taxes on nonrenewable resources, which would conserve the natural resources and encourage the utilization of the renewable and reusable resources. In line with what was mentioned, Pitt et al. (2009) concluded that fiscal incentives, penalties, and legislations are the key drivers of sustainable construction.

As mentioned before, governmental regulation has great role in market culture orientation as to foster construction firm’s sustainable performance (Bamgbade et al., 2017). In spite of that, survey respondent ranked the “Governmental regulations and polices” as the penultimate driver to SCPM. Finally, the survey respondent selected the role of sustainability in attainment of local community satisfaction as the last ranked driver to SCPM.

5.2.2 Research Hypothesis-Testing Discussion.

Inferential statistics approach with their relative statistics findings were as follow:

H1: The implementation of sustainable project inception practices has a positive effect on the CPM performance in the West Bank.

Data analysis demonstrated that the implementation on sustainable project inception practices affects CPM performance positively ($\beta = 0.308$, $t = 2.810$, $P = 0.006$). This is in consistent with research prediction, and in line with the existing literature concerning sustainable practices through the CP inception stage (Shen et al., 2010). In general, the assessment of project sustainability performance at the various project life-cycle stages is the best choice among alternatives, because that offers the opportunity to focus resources on the stage that has the significant impacts. In this way, cost, time, and resources can be utilized more effectively and efficiently (Ding and Shen, 2010). According to Shen et al. (2002), the great project contribution to the sustainable development is when sustainability is considered since the project investment decision is made. In addition, Shen et al. (2010), found that less attention is given to the environmental and social issues during the project feasibility stage, so they suggested shifting from the traditional project feasibility approach to a new approach that embraces the principles of sustainable development.

More and more, interviewees consented that the attainment of SCPM performance begins from the project inception stage, since the project location, the environmental assessment plan, the existing infrastructure, the early participation of suppliers, contractors, and stockholders have serious effect on the project sustainable performance.

H2: The implementation of sustainable project design practices has a positive effect on the CPM performance in the West Bank.

Data analysis demonstrated that the implementation on sustainable project design practices affects CPM performance positively (β = 0.076, t =5.221, P =0.000). Interviewees also confirmed that the design documents have a great influence on the project sustainable performance. In the design stage the project layout, materials and structures are selected, so in addition to the SPM performance, it also affects the project functional performance, such as ventilation, air conditioners, lighting, heating, electrical, and water systems (Shen et al., 2017). In addition, sustainable design adds new values to construction project constrains other than cost, time, and quality, such like minimizing the natural environmental degradation, creation of healthy and comfort-built environment, and improves the resource consumption (Sev, 2009). Therefore, and in line with the research expectation, integrating sustainability requirements in the construction design practices plays a serious role in SCPM attainment.

H3: The implementation of sustainable project tendering practices has a positive effect on the CPM performance in West Bank.

Data analysis demonstrated that the implementation on sustainable project tendering practices affects CPM performance positively (β = 0.170, t =6.410, P =0.000). Concerning tendering sustainability practices and as discussed by interviewees; tendering stage, and contractors, suppliers, and designers' selection procedures have a valuable effect on the SCPM

performance. In this regard, they suggested including “contractor, supplier, and designer experience in sustainability issues” as an important selection criterion. In addition, interviewees contended that prioritizing the financial criteria over the technical criteria in project tendering procedure seriously affects the CPM performance and so affects sustainability requirements.

H4: The implementation of sustainable project implementation practices has a positive effect on the CPM performance in the West Bank.

Data analysis demonstrated that the implementation on sustainable project implementation practices affects CPM performance positively ($\beta = 0.129$, $t = 2.480$, $P = 0.017$). This result is in line with the existing literature and interviewees expectations (Sev, 2009). Project construction stage is the responsible stage of delivering the project output, waste and dust generation, surrounding environment pollution, traffic blockage, resources depletion, water and energy consumption (Sharrard et al., 2008). Therefore, committing to sustainability requirements and practices during the construction project implementation stage is an ingredient for SCPM attainment (Banihashemi et al., 2017; Amiril et al., 2014; Shen et al., 2010)

H5: Drivers of SCPM have a positive effect on CPM performance in the West Bank.

Data analysis demonstrated that the surveyed SCPM drivers affects CPM performance in the West Bank positively ($\beta = 0.591$, $t = 8.145$, $P = 0.000$).

This result is in line with interviewees suggestions in order to attain SCM, such like governmental and legal support, financial incentives and tax reduction strategies. According to AlSanad (2015), it's very important to identify drivers of in order to motivate the implementation of sustainable practices. In addition, drivers of change constitute the convincing reason and a strategy to integrate sustainability principles in the CPM approach (Vanegas and Pearce, 2000). This provides an opportunity to build a framework as an execution plan to propel decision makers and construction organizations to incorporate sustainability principles through the life cycle of CPM.

5.3 SCPM Framework

As in chapter one, one of the important outputs of this research is developing and gathering framework that would constitutes a guideline for construction institution in adopting sustainability requirements in their CPM performance. Each stage in this study contributed somehow in this framework development, i.e., the existing literature presented the basis for this framework, and then it was further developed with reference to the survey and data analysis findings. Finally, the research validated the proposed framework through consulting experts from different institutions to make the framework more in line with the construction sector in the West Bank.

Now and before proceeding in the framework development, it is important to understand the "Modes of Organizational Chang" demonstrated by Vanegas and Pearce (2000). In brief, and as shown in Figure 14, modes of change is categorized under four classes, such classes depends on whether the organization is reactive (resist change until forced) or proactive (addresses potential problems preventatively), and weather triggers to change are internal or external to the organization.

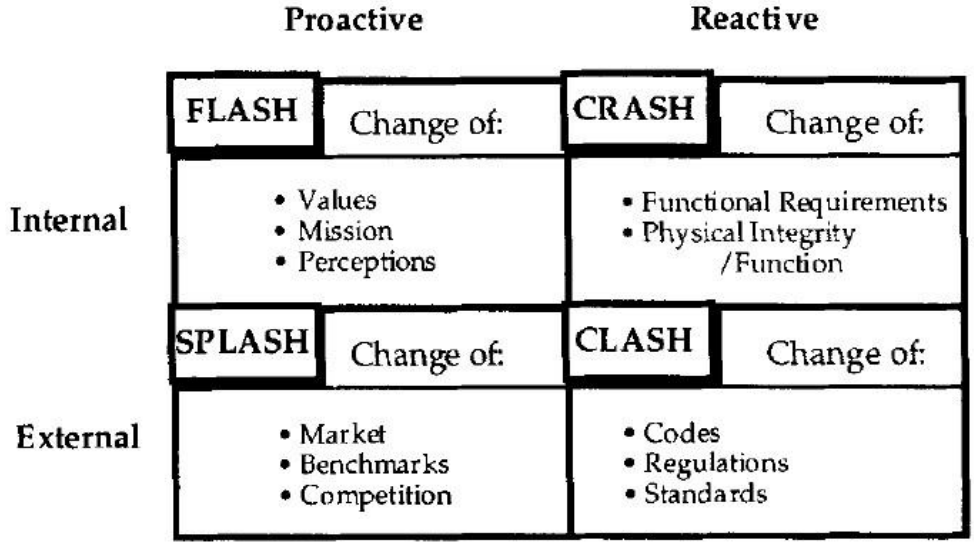

Figure 14: Modes and Triggers of Organizational Change

First, in proactive institution, the **Flash** triggers are changes in the institution internal mission, values, or perceptions for entities, who make interventions decisions for the future. Second, **Splash** triggers (Keeping up with the Joneses), in other words, keeping eyes on the competitors and taking proactive steps to stay at the leading edge. Third, in reactive organizations, the **Crash** triggers are those who resist change until

breakdown occurs. Finally, the **Clash** triggers, occurs in response to an external change, such like new regulations or standards.

The organization can be subjected to more than one type of change triggers. As demonstrated in literature, the most likely modes of change toward sustainable built environment are the Flash and Splash triggers, given that sustainability is not preserved as mandatory or externally imposed. This is when the institutions follow sustainability requirements to keep up with the green market, or to get financial benefits due to higher efficiency and productivity in addition to protecting the environment (Liddle 1994; Kinlaw 1992).

Therefore, in this study the proposed changing mode is the "Flash triggers" where the framework started with increasing sustainability awareness throughout the institution by understanding motivators for adapting sustainability, existing lessons learned, and the principles of SCPM. After that, the framework came to adapting sustainability as a part of the institution strategy, by identifying the sustainability legislations and policy, and then communicate it throughout the institution.

In addition, for developing the framework conceptual structure, a helpful guideline is the Deming Cycle (the PDCA cycle); this cycle is based on four management categories: planning for activities, implementation, monitoring and quality assurance, and act (Cascio, 1996). PDCA cycle was proudly adopted to environmental management systems, ISO 14000

standards, and quality management systems (Dudin et al., 2015; Mitra, 2008).

Based on the above, a framework for integrating sustainability practices in CPM in the West bank was formulated as shown in Figure 15.

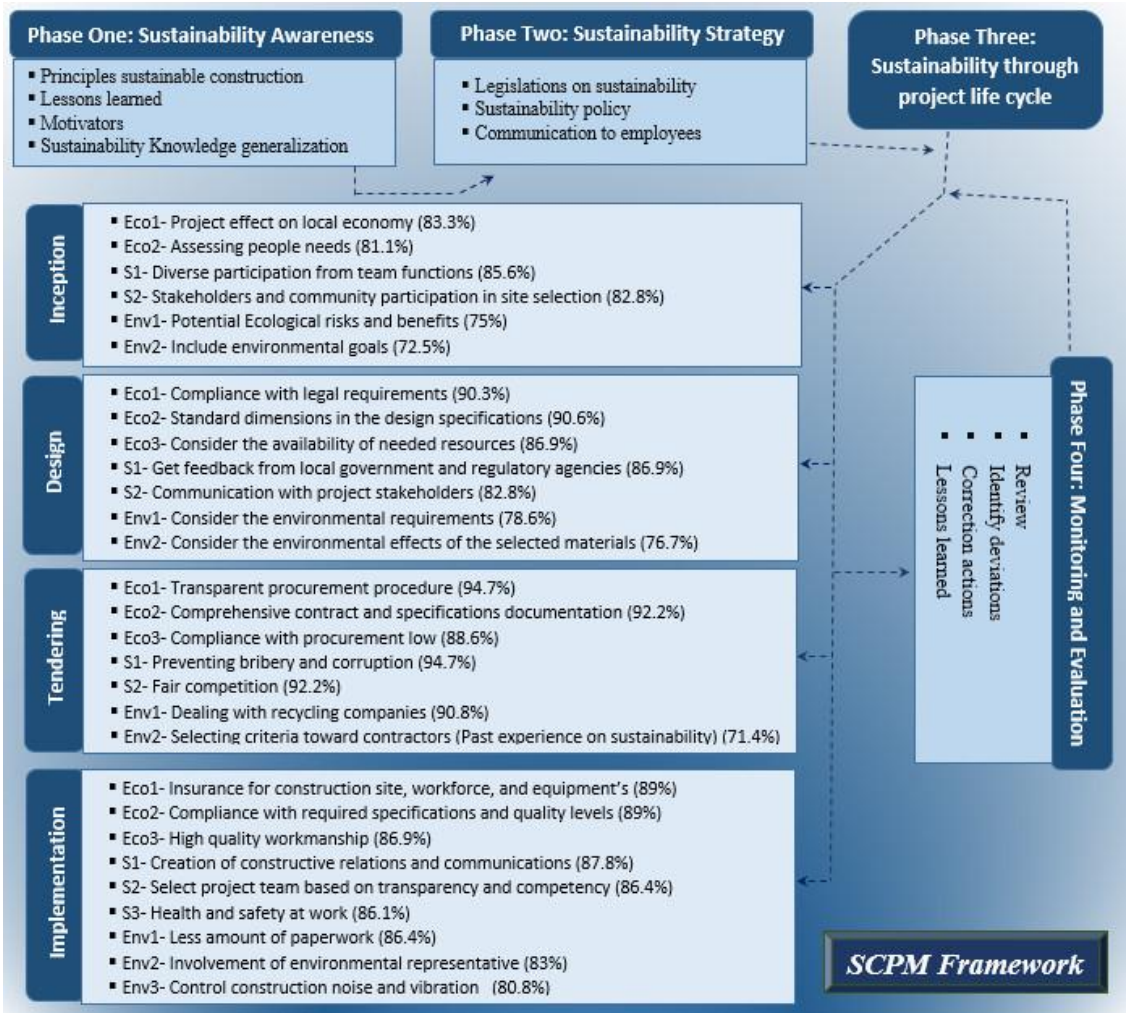

Figure 15: SCPM Developed Framework.

Phase one: Sustainability Awareness

Lack of knowledge and training on sustainability concept, and the lack of information on sustainable construction issues and solutions were highly

ranked as serious barriers to successful adoption of SCPM practices. The interviewed experts from the Palestinian construction sector also confirmed that. Therefore, that encourages initiating the proposed framework with a preparatory stage concerns rising the organization awareness in sustainability issues, which would include sustainability motivators, the global sustainability principles, past experiences in SCPM and lessons learned, and spread this knowledge throughout the organization.

For example, according to Kinlaw (1992), other than the better life quality for current and future generations through protecting environment, those who adopt sustainability in their CPM process are rewarded with new markets, decreased liabilities, and increased efficiency and productivity. In addition, energy and resource conservation, less rework and field adjustments corporate reputation and image were highest ranked drivers of SCPM in construction sector. Therefore, realizing sustainability benefits to the institution could serve as internal triggers of change.

Phase Two: Sustainability Strategy

After rising the sustainability awareness of the construction institution, the second phase starts with commitment to sustainability principles, legislations, environmental and social responsibilities, this through designing a unique institution policy with relevance to its own background and features. Then this sustainability policy should be communicated to the human forces in the construction institution (Tan et al., 2011).

The mentioned commitment policy and the identified sustainability principles need a clear sustainability strategy; through this strategy, the institution draws its special track practices to reach sustainability goals (Baumgartner & Ebner, 2010).

For example, Sev (2009) proposed a framework for stakeholders in construction industry; this framework relays on three sustainability principles: resource management, life-cycle design and design for human and environment. Then these fundamental principles are articulated into institution strategies for sustainability implementation, which in turn are translated into actions and practices.

Phase Three: Sustainability through Project Life Cycle

This research explored required sustainability practices during each phase of CPM life cycle, therefore the proposed sustainability adaptation strategy was by following sustainability requirements through the project management life cycle. This is in line with Tshudy (1996), who concluded that sustainability adaptation in CPM needs a holistic understanding of all environmental and social impacts throughout the project life cycle. The life cycle approach provides an opportunity to understand how the project planning, design, and construction affects the environment and the surrounding community. Therefore, in this framework, and within each construction stage, according to the data analysis results the adapted sustainability practices were the highest implemented sustainability practices by engineers in each sustainability pillar as shown in Fig (15).

Once the execution of procedures for each phase begins, the common elements of monitoring/control and feedback capture provide the capability to adjust procedures as needed to steer the project toward sustainability.

Phase Four: Monitoring and Evaluation

The monitoring and evaluation stage close the loop of the developed framework; this is because the main inspiring goal from implementing SCPM performance is to improve the institution sustainable performance and business competitiveness in a continuous manner.

Therefore, for each stage in CPM process, the institution should evaluates on a regular basis the sustainability performance, identify deviations, and take correction actions, such corrections could be in the organization sustainability policy level, strategy level, or corrections for sustainability practices within a specifies stage (Tan et al., 2011). These evaluations, feedbacks, and correction actions capture different and diverse lessons learned within each sustainability implementation phase, which in turn contribute significantly to the knowledge base of SCPM sector.

Chapter Six

Conclusions & Recommendations

6.1 Chapter Overview

This chapter constitutes a summary of the research outputs, first it presents the conclusion of the data analysis findings, and then it comes to the research proposed recommendations and the research contribution to the SCPM sector. Finally, the chapter presents the limitations subjected the implementation of the research in different stages, and ends with suggestions on future researches.

6.2 Conclusions

The main objectives of this research is to explore practices affecting sustainable construction project management in the West Bank, to identify barriers to successful sustainability integration in CPM and drivers to SCPM performance, and finally to develop a framework that assists construction institutions in the West Bank to talk their first steps in SCPM.

The research revealed that implementing and commitment to sustainability practices within each stage of CPM (inception, design, tendering, and implementation) have great influence on the overall SCPM performance of construction institutions. It also demonstrated that institutions highly comply with the economic sustainability practices much more than social

and environmental practices, especially with it reflects positive economic influence on their institutions.

The qualitative and quantitative research results supported the high influence of all explored research drivers on SCPM performance, in addition, results also reflected high agreement level with the explored barriers to the successful SCPM adaptation.

The analysis results and as strongly supported be interviewed experts; institutions commit to environmental and social sustainability practices when it is compulsory and requested by the governmental legislations or when it's requested in the project private and general specifications in the contracting documents, otherwise, such commitment depends on the institution awareness and knowledge on sustainability benefits.

Finally, with reference to existing literature and research findings, the researcher developed a practical SCPM framework as a guideline for construction institutions, which assists them in adopting and integrating sustainability as a strategy in their firms and in developing their sustainable performance. The framework phases, structure, content, and procedure were validated with field experts in order to ensure its workability and effectiveness in the Palestinian construction sector.

6.3 Recommendations

With relevance to research objectives, existing literature, survey analysis, and interviewees advices, the research suggested the following recommendations concerning SCPM:

✓ Including sustainability knowledge in the Palestinian Engineering colleges' curriculums.

✓ Rising governmental sustainability awareness, especially in the decision makers levels.

✓ Adopting environmental and social sustainability requirements by the Palestine Standards Institution (PSI).

✓ Developing governmental SCM promotion programs, supported with incentives and legal framework.

✓ Develop training programs in construction institutions for top management, project managers and the PMT concerning sustainability concepts, principles, requirements, and benefits in CPM.

✓ Adopting the SCPM Framework developed in this study as a guideline for integrating sustainability in CPM.

✓ Consulting contractors and suppliers in the project inception stage, because they have sufficient experience in construction methods, material, and plans. They provide advices concerning environmental effects, water and energy consumption, air and noise pollution, and safety requirements.

✓ Adopting an efficient system for monitoring and controlling sustainability performance, that is necessary to build the national database on SCPM experiences and lessons learned.

6.4 Research Contributions

6.4.1 Theoretical Contributions

This research contributed to the existing literature concerning sustainability in CPM on different levels; practically, this study will assist construction institutions in defining their sustainability policy and creating their adaptation strategy. Second, it helps construction institutions, project managers, and practitioners in the construction sector to understand sustainability principles, pillars, requirements, and practices through the CPM consecutive stages. Finally, this research will enrich sustainability knowledge in the Palestinian construction field, besides the creation of local experiences and lessons learned portfolio, because this study stands as the first step for understanding and adopting sustainability in the Palestinian CPM field. In addition, it explores the barriers that would hinder the successful adaptation of SCPM, and at the same time, it presented the needed drivers of change toward sustainable performance in the Palestinian CMP field.

6.4.2 Managerial Implications

The research created a practical framework for institutional change toward sustainable performance in CPM stage by stage, where in contrast with the traditional existing frameworks; the researcher adopted and integrated the "Modes of organizational change" technique and the Deming Cycle besides the input and validation by experts in the CPM field. This framework draws the route map for construction institutions in the West Bank by providing the SCPM framework, as a very practical tool to integrate sustainability knowledge, principles, requirements, and practices in their CPM procedure.

6.5 Limitations and Future Research Work

As mentioned above, this research is one of the first researches concerns construction sector effect on sustainable development in the West Bank, so, it is normal that several limitations subjected its preparation. The worth mention limitations were: lack of knowledge on sustainability pillars and principles, and so, this limited experience and awareness on SCPM practices among project managers, governmental decision makers, and most of CPM practitioner, affected in somehow the survey data collection procedure. That needed the researcher to explain and clarify most of the surveyed sustainability practices to the respondents, and that required additional time and effort.

Respondent tendency to present positive image of their construction institutions, especially these who belong to the private sector, which affected the sincerity of some responses to the survey.

Lack of awareness on sustainability benefits leads to institutions resistance to change and stick on traditional construction management paradigm which constrained by time, cost, and quality.

The absence of literature on SCPM in Palestine made the gap and the scope of this study extremely wide, and so, most of sustainability issues in CPM still have to be more explored.

Finally, the relatively small sample size, and most of respondents were from engineering design offices with limited participation of contracting companies, this is because their neglected participation in the early stages of CPM.

Therefore, this area of knowledge still needs many researches and too much exploration in Palestine. Such like exploring sustainability practices within each CPM stage separately, exploring the effect and needed sustainability practices the project disposal stage, and validating of the SCPM framework in different contexts and with larger samples.

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Appendices

Appendix (A)

Table (A): Practices/ affecting sustainability in CPM stages.

Stage	Category	Sustainability Practices	Reference
1. Inception& Feasibility	Economic Sustainability Practices	• Market forecasting. • Analyzing the demand and supply of the final product • Assessing people needs. • Studying the project effect on local economy, such like local employment and local material consumption. • Considering the impact on tourism value. • Analyzing the total operation profit and total cost of construction, operation, maintenance and disposal.	Shen et al, (2010) Amiril et al. (2014) Diaz-Sarchaga et al., (2017) Ugwu and Haupt (2007) Shen et al, (2007)
	Social Sustainability Practices	• Avoiding impact on cultural heritages. • Community participation and public acceptance toward the project. • Improve the local infrastructure capacity. • Provision of community amenities.	Shen et al, (2010) Amiril et al. (2014) Ugwu and Haupt (2007) Abedel-Raheem and Ramsbottom (2016)
	Environmental Sustainability Practices	• Considering the Eco-environmental sensitivity of the project location. • Examining the project associated potential ecological risks and benefits. • Studying the potential air, water and noise pollution from the project through construction and post-construction stages.	Shen et al, (2010) Shen et al, (2007) (Lim, 2009). Ugwu and Haupt (2007)
2. Design	Economic Sustainability Practices	• Considering the availability of needed resources (material, machinery, etc.). • Selection of durable, reusable, maintainable, and recycled material. • Employing realistic cost and time estimates. • Compliance with legal requirements. • Standard dimensions in design specifications.	Shen et al, (2010) Ugwu and Haupt (2007)

	Social Sustainability Practices	• Designing an effective health and safety protocols • Communication with and participation of all stakeholders. • Design for emergencies, such like earthquakes, fire, flooding etc.	Shen et al, (2007) Amiril et al., 2014
	Environmental Sustainability Practices	• Pay attention for the environmental impact of selected materials. • Employ the use of standardized components to improve build ability and reduce waste generation. • Considering environmental requirements in the project design	Shen et al, (2007) Ugwu and Haupt (2007)
3. Tendering	Economic Sustainability Practices	• Comprehensive contract and specifications documentation. • Compliance with procurement law. • Transparent procurement procedure.	IS, (2016) Ugwu and Haupt, 2007
	Social Sustainability Practices	• Pre-tendering and tendering auditing and investigation. • Preventing bribery and corruption. • Fair competition	Amiril et al. (2014) Abedel-Raheem and Ramsbottom (2016) Silvius, 2010
	Environmental Sustainability Practices	• Selection criteria toward contractors, and investigate their level of awareness of sustainability principles and their previous records of sustainable projects implementation. • Amount of paperwork	Banihashemi et al. (2017) Ugwu and Haupt (2007)
4. Construction	Economic Sustainability Practices	• Compliance with the required specifications and quality level. • High quality workmanship. • Efficient resource allocation and reusability of molds, frameworks etc. • Use modern construction technology and methods for execution of works. • Inspection and maintenance of construction equipment. • Insurance for construction site, workforces, and equipment.	Shen et al, (2007) Amiril et al., 2014 Ugwu and Haupt (2007)

	Social Sustainability Practices	• Creation of constructive relationships and communication between project stakeholders. • Select the project management team members based on competency and transparency • Education on sustainability requirements for the project management team. • Incentives and rewards for the project management team • Health and safety at work • Participation of all parties in project monitoring and decision-making • Promote community harmony within diverse project workforce	Silvius (2010) Banihashemi et al. (2017) Ugwu and Haupt (2007) O'Connor et al. (2016) Amiril et al., 2014
	Environmental Sustainability Practices	• Amount of water consumption and reuse. • Extent of energy consumption and use of renewable energy sources • Managing hazardous materials (supply, use, and disposal) • Considering transportation effect (extent of blockage) • Control noise and vibration • Construction waste management (recycling, reuse, and disposal routes) • Compliance with environmental protection laws and regulations • Amount of paperwork • Involvement of environmental representative in the project management team	Silvius (2010) Shen et al, (2010) Banihashemi et al. (2017) Shen et al, (2007) (Lim, 2009). Ugwu and Haupt (2007) Amiril et al., 2014 Zhang et al., (2014)

Appendix (B)

Table (B): Table for the minimum R-squared method.

Maximum number of arrows pointing at a construct	Minimum R^2 in the model			
	.10	.25	.50	.75
2	110	52	33	26
3	124	59	38	30
4	137	65	42	33
5	147	70	45	36
6	157	75	48	39
7	166	80	51	41
8	174	84	54	44
9	181	88	57	46
10	189	91	59	48

Appendix (C)

Table C: Interview and Questionnaire Validation Committee.

	University	Role	Specialization
Consultant 1	Palestine Polytechnic University	Member of the Palestinian Green Building Council	PHD in Soil Engineering
Consultant 2	Palestine Polytechnic University	Head of Architectural and Civil Engineering Faculty	PHD in Structural Engineering
Consultant 3	Al-Najah National University	Head of Civil Engineering Faculty	PHD in Civil Engineering

Appendix (D)

An-Najah National University
Faculty of Graduates Studies
Engineering Management Program

Interview concerning Sustainability in construction Project Management Practices in the West Bank/Palestine

Dear Respondent,

Thank you very much for your time and your cooperation is highly appreciated.

The objective of this research is to explore Practices affecting sustainable construction project management practices in the West Bank/Palestine.

This interview is prepared to be conducted with experts in construction field in the West Bank/ Palestine. In this research, it is a tool to identify Practices (enablers and barriers) affecting sustainability following the construction project management consecutive stages: Inception & feasibility, Design, Tendering and construction, according to the sustainability pillars: Economic, Social, and Environmental.

It should take around 25 minutes to complete this interview.

Please be assured that the information in this Interview will be used only for scientific research.

Prepared by: Eng. Moutaz Hroub

Part 1:

1. Name:
2. Organization:
3. Position:
4. Experience in construction management field:

Part 2: Questions asked to experts in the interviews:

1. **For the Palestinian construction management field, do you think that sustainability requirements are important as another success criterion alongside the iron triangle (time, cost and scope)?**

   If Yes,

   Follow up question: What sustainability practices should be adopted in the inception stage in construction project management?

   Follow up question: What sustainability practices should be adopted in the Design stage in construction project management?

   Follow up question: What sustainability practices should be adopted in the Tendering stage in construction project management?

   Follow up question: What sustainability practices should be adopted in the Construction stage in construction project management?

2. **Which role has sustainability in the project management process in your organization?**

   Follow up question: If practiced, what benefits your organization achieved as a result of adopting sustainability practices?

3. **What are the key Drivers affecting successful implementation of sustainability in construction project management in your organization?**

4. **What are the key barriers affecting successful implementation of sustainability in construction project management in in your organization?**

5. **Would you like to add any comments with respect to implementing sustainability practices in construction projects in your organization?**

Appendix (E)

جامعة النجاح الوطنية

كلية الدراسات العليا

قسم الادارة الهندسية

مقابلة حول عوامل الاستدامة المؤثرة في ادارة المشاريع الانشائية في الضفة الغربية/فلسطين

عزيزي القارئ،

أشكرك على تخصيص جزء من وقتك لهذه المقابلة.

الغرض من هذا البحث هو معرفة عوامل الاستدامة المؤثرة في ادارة المشاريع الانشائية في الضفة الغربة/فلسطين.

تم إعداد هذه المقابلة لإجرائها مع خبراء في مجال قطاع الانشاءات في الضفة الغربية / فلسطين. هذا البحث هو أداة لتحديد العوامل (التمكينية والمعيقات) التي تؤثر على تطبيق أركان الاستدامة (الاقتصادية والاجتماعية والبيئية) في المراحل المتتالية لإدارة المشاريع الانشائية : التأسيس والجدوى ، التصميم ، المناقصة و التنفيذ.

هذه المقابلة سوف تستغرق من وقتك حوالي 15 دقيقة، علما بأن كافة المعلومات سوف تكون سرية ولن تستخدم إلا لغرض البحث العلمي.

الباحث: م. معتز الحروب

القسم الأول:

1. **الأسم:**
2. **المؤسسة:**
3. **الموقع الوظيفي:**
4. **الخبرة في مجال الانشاءات:**

الجزء 2: أسئلة المقابلة:

1. كيف ينظر إلى متطلبات الاستدامة في مؤسستك؟
2. ما هو دور متطلبات الاستدامة في عملية إدارة المشروع في مؤسستك؟
3. ما هي معايير تقييم ممارسات الاستدامة في عملية إدارة المشروع في مؤسستك؟
4. بالنسبة لقطاع الانشاءات في فلسطين، هل تعتقد أن متطلبات الاستدامة مهمة كمعيار نجاح آخر بجانب محددات نجاح المشروع المعروفة (time, cost and scope)
5. كيف ينبغي تبني الاستدامة في إدارة المشروع النشائي؟
6. ما هي العوامل الرئيسية التي تؤثر على التنفيذ الناجح للاستدامة في إدارة المشاريع الانشائية في مؤسستك؟
7. في حال تم تطبيقها، ما هي الفوائد التي حققتها مؤسستك نتيجة اعتماد ممارسات الاستدامة؟
8. هل ترغب في إضافة أي تعليقات فيما يتعلق بتنفيذ ممارسات الاستدامة في المشاريع الانشائية في مؤسستك؟
9. ما هي المعيقات الرئيسية التي تؤثر على التنفيذ الناجح للاستدامة في إدارة مشاريع البناء في مؤسستك؟

Appendix (F)

An-Najah National University

Faculty of Graduates Studies

Engineering Management Program

Questionnaire concerning Sustainability in construction Project Management in the West Bank/Palestine

Dear Respondent,

Thank you very much for your time and your cooperation is highly appreciated.

The objective of this research is to explore Practices, Barriers and Drivers affecting sustainable construction project management practices in the West Bank/Palestine.

The questionnaire is divided into two parts: the first part concerning general information, and the second part is for ranking sustainability Practices. The second part is divided into four sections following the construction project management consecutive stages: Inception & feasibility, Design, Tendering and construction. Each section is divided into three subsections according to the sustainability pillars: Economic, Social, and Environmental.

Kindly, in relevance to project management practices for your organization, indicate the level of implementation of each sustainability practice.

It should take around 15 minutes to complete the questionnaire.

Please be assured that the information in this questionnaire will be used only for scientific research.

Prepared by: Eng. Moutaz Hroub

Moutaz-hroub@hotmail.com

Part One: General Questions

1. The Organization experience in Construction Field (years)?

◯ Less than 3 ◯ 3-6 ◯ 6-10 ◯ more than 11

2. Place of your organization?

◯ Ramallah ◯ Nablus ◯ Jenin ◯ Tulkarm ◯ Sulfit
◯ Hebron ◯ Tubas ◯ Qalqilya ◯ Jericho ◯ Jerusalem
◯ Bethlehem

3. Type of organization you are working in/for?

◯ Engineering organization ◯ Governmental organization
◯ NGO ◯ Municipality
◯ International Organization ◯ Other

4. Engineering office classification (For Engineering Offices)?

◯ 3rd class ◯ 2nd class ◯ 1st class ◯ Consultant

5. Respondent position?

◯ General Manager ◯ Chief Excusive officer (CEO) ◯ Project Manager
◯ Project Engineer ◯ Other

6. Respondent experience in Construction field (years)?

◯ Less than 3 ◯ 3-6 ◯ 7-10 ◯ more than 11

Part Two: Ranking sustainability Practices.

First section: According to your organization project management practices, indicate the level of implementation of each sustainability Practices in the **inception & feasibility** stage.

Note: Use ✓ to select a rank

Economic Sustainability Practices		Level of Implementation				
		Always	Often	Sometimes	Seldom	Never
1	Preparing cost model that aligns resources with program goals to ensure project priorities are not mismatched to resources (Matthiessen and Morris 2004)					
2	Assessing people needs					
3	Studying the project effect on local economy, such like local employment and local material onsmption.					
4	Considering the impact on tourism value					
5	Finalize economic and ecological goals based on cost/benefit analysis					
6	Shifting from analysis short term cost and return on investment to long term gains from operational savings (Robichaud and Anantatmula, 2010)					
Social Sustainability Practices						
1	Avoiding impact on cultural heritages.					
2	Include key external stakeholders and Community representatives, and insure public acceptance toward the project. (Robichaud and Anantatmula, 2010)					
3	Include Diverse representation from the project team functions					
4	Improve the local infrastructure capacity.					
5	Provision of community amenities.					
6	Select site based on stakeholder involvement including community input					
Environmental Sustainability Practices						
1	Include Environmental goals (Robichaud and Anantatmula, 2010)					
2	Considering the Eco-environmental sensitivity of the project location.					
3	Consult LEED accredited professional (Robichaud and Anantatmula, 2010)					
4	Examining the project associated potential ecological risks and benefits.					
5	Studying the potential air, water and noise pollution from the project through construction and post-construction stages.					

Second section: According to your organization project management practices, indicate the level of implementation of each sustainability Practices in the **Design** stage.

Note: Use ✓ to select a rank

Economic Sustainability Practices		Level of Implementation				
		Always	Often	Sometimes	Seldom	Never
1	Considering the availability of needed resources (material, machinery, etc.).					
2	Selection of durable, reusable, maintainable, and recycled material.					
3	Employing realistic cost and time estimates.					
4	Compliance with legal requirements.					
5	Standard dimensions in design specifications.					
Social Sustainability Practices						
1	Designing an effective health and safety protocols					
2	Communication with and participation of all stakeholders.					
3	Design for emergencies, such like earthquakes, fire, flooding etc.					
4	Get feedback from local government planners and other regulatory agencies in the early stages to ensure compliance with local, state and federal guidelines. (Robichaud and Anantatmula, 2010)					
Environmental Sustainability Practices						
1	Pay attention for the environmental impact of selected materials.					
2	Employ the use of standardized components to improve build ability and reduce waste generation.					
3	Considering environmental requirements in the project design					

Third section: According to your organization project management practices, indicate your level of implementation of each sustainability Practices in the **Tendering** stage.

Note: Use ✓ to select a rank

Economic Sustainability Practices		Level of Implementation				
		Always	Often	Sometimes	Seldom	Never
1	Contracts include performance agreements, incentives, and bonuses for implementing sustainable practices and exceeding sustainability goals (Pennsylvania State University 2004).					
2	Comprehensive contract and specifications documentation					
3	Compliance with procurement law					
4	Transparent procurement procedure					
Social Sustainability Practices						
1	Pre-tendering and tendering auditing and investigation.					
2	Preventing bribery and corruption.					
3	Fair competition					
Environmental Sustainability Practices						
1	Selection criteria toward contractors, and investigate their level of awareness of sustainability principles and their previous records of sustainable projects implementation.					
2	Contracts should also include specific provisions for LEED points and agreements to return unused materials to vendors. (Robichaud and Anantatmula, 2010)					
3	Less amount of paperwork					

Fourth section: According to your organization project management practices, indicate the level of implementation of each sustainability Practices in the **Construction** stage.

Note: Use ✓ to select a rank.

Economic Sustainability Practices		Level of Implementation				
		Always	Often	Sometimes	Seldom	Never
1	Compliance with the required specifications and quality level.					
2	High quality workmanship.					
3	Efficient resource allocation and reusability of molds, frameworks etc.					
4	Use up to date and modern construction technology and methods for execution of works.					
5	Inspection and maintenance of construction equipment.					
6	Insurance for construction site, workforces, and equipment.					
Social Sustainability Practices						
1	Creation of constructive relationships and communication between project stakeholders.					
2	Select the project management team members based on competency and transparency					
3	Education on sustainability requirements for the project management team.					
4	Incentives and rewards for the project management team					
5	Health and safety at work					
6	Participation of all parties in project monitoring and decision-making					
7	Promote community harmony within diverse project workforce					
Environmental Sustainability Practices						
1	Amount of water consumption and reuse.					
2	Extent of energy consumption and use of renewable energy sources					
3	Managing hazardous materials (supply, use, and disposal)					
4	Considering transportation effect (extent of blockage)					
5	Control noise and vibration					
6	Construction waste management (recycling, reuse, and disposal routes)					
7	Compliance with environmental protection laws and regulations					
8	Amount of paperwork					
9	Involvement of environmental representative in the project management team					

Part Three: **Drivers** and **Barriers** to the implementation of Sustainable Construction Project Management in the West Bank.

- Please indicate your level of agreement with the following statements.
- Use ✓ to select the suitable choice

No.	Barriers to the implementation of Sustainable Construction	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
1	Lack of knowledge and training about the concept of Sustainability					
2	Lack of legal aspects concerning sustainability in construction management					
3	Tendency to use traditional design and construction methods					
4	Lack of information on sustainable construction issues and solutions					
5	Lack of interest of stakeholders on sustainability Issues "Sustainability is not a priority"					
6	Sustainability may increase in the construction cost on the short terms, and long pay back periods from sustainable practices					

No.	Drivers to the implementation of Sustainable Construction	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
1	Tax reduction incentives related to investment effort in sustainable construction practices.					
2	Energy and resource conservation					
3	Governmental regulations and polices					
4	Corporate reputation and image					
5	Satisfaction of local community					
6	New kinds of partnerships and project stakeholders					
7	Waste reduction					
8	Environmental benefits					
9	Improve water usage					
10	Less rework and field adjustments					

Part Four: Sustainable Construction Project Management Performance

- Please indicate your level of agreement with the following statements.
- Use ✓ to select the suitable choice.

No.	Practices affecting Sustainable Construction Project Management Performance in the West Bank	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
1	Developing programs and mechanisms that support adoption of sustainability in CPM					
2	Education and awareness rising programs for politicians and strategic decision makers					
3	Top Management support and awareness of sustainability principles in CPM					
4	Incorporating sustainability issues within the organization report					
5	Selecting Project Manager who are familiar with SCPM principles					
6	Developing and using appropriate mechanisms and tools for monitoring and evaluating organizational and industry performance					
7	Balance human needs with the carrying capacity of the natural and cultural environment (Sev, 2009)					
8	Include capital investment toward sustainable initiatives (Robichaud and Anantatmula, 2010)					
9	Sustainability requirements are reviewed with each subcontractor prior to commencing work (Pennsylvania State University 2004)					
10	Government regulators are working as a partner in the project, as opposed to an outside influence. (Robichaud and Anantatmula, 2010)					

Part Five: What would you like to add, comment about Sustainability implementation in Construction Project Management in the West Bank?

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Appendix (G)

جامعة النجاح الوطنية

كلية الدراسات العليا

قسم الادارة الهندسية

استبيان حول عوامل الاستدامة المؤثرة في ادارة المشاريع الانشائية في الضفة الغربية/فلسطين

عزيزي القارئ،

أشكرك على تخصيص جزء من وقتك لقراءة وتعبئة هذا الاستبيان.

الغرض من هذا البحث هو معرفة عوامل الاستدامة المؤثرة في ادارة المشاريع الانشائية في الضفة الغربة/فلسطين.

الاستبيان مقسم إلى جزئين:

- الجزء الأول يهدف إلى جمع معلومات عامة حول شركة المقاولات أو المكتب الهندسي الذي تعمل لديه.
- الجزء الثاني مقسم إلى 4 أقسام تتبع مراحل إدارة المشروع الانشائي كالآتي: مرحلة دراسة الجدوى، مرحلة التصميم، مرحلة التعاقد، ومرحلة التنفيذ.

  كل من هذه المراحل مقسم إلى 3 فروع تتبع مقومات الاستدامة (اقتصادية، اجتماعية، وبيئية).

المطلوب، فيما يتعلق بممارسات ادارة المشاريع الانشائية في مؤسستكم، يرجى الاشارة إلى مستوى تنفيذ كل من ممارسات الاستدامة المذكورة.

هذا الاستبيان سوف يستغرق من وقتك حوالي 15 دقيقة، علما بأن كافة المعلومات سوف تكون سرية ولن تستخدم إلا لغرض البحث العلمي.

الباحث: م. معتز الحروب

القسم الأول: أسئلة عامة

6. عدد سنوات خبرة مؤسستكم في ادارة المشاريع الانشائية:

◯ أكثر من 20 سنة ◯ 15-20 ◯ 10-15 ◯ 5-10 ◯ أقل من 5 سنوات

7. موقع المقر الرئيسي للمؤسسة

◯ سلفيت ◯ طولكرم ◯ جنين ◯ نابلس ◯ رام الله
◯ القدس أريحا ◯ قلقيليا ◯ طوباس ◯ الخليل
◯ بيت لحم

8. نوع المؤسسة التي تعمل لديها.

◯ غير ذلك ◯ شركة مقاولات ◯ مكتب هندسي

9. (للمكاتب الهندسية) ما هو تصنيف المكتب الهندسي الذي تعمل لديه:

◯ استشاري ◯ فئة أولى ◯ فئة ثانية ◯ فئة ثالثة

5. (لشركات المقاولات) ما هو تصنيف الشركة حسب تصنيف اتحاد المقاولين الفلسطينيين:

◯ درجة أولى ◯ درجة ثانية ◯ درجة ثالثة ◯ درجة رابعة ◯ درجة خامسة

6. التخصص الرئيسي

◯ مياه وصرف صحي ◯ كهرو ميكانيك ◯ طرق ◯ أبنية
◯ أشغال عامة وترميم

7. موقعك في الشركة/ المكتب الهندسي:

◯ غير ذلك ◯ مهندس ◯ مدير مشروع ◯ مدير الشركة

الجزء الثاني: تقيم عوامل وممارسات الاستدامة

أولا: فيما يتعلق بممارسات ادارة المشاريع الانشائية في مؤسستكم، يرجى الاشارة إلى مستوى تنفيذ كل من ممارسات الاستدامة المذكورة ضمن مرحلة دراسة الجدوى.

ملاحظة: ضع اشارة ✓ في مربع الخيار المناسب.

	عوامل الاستدامة الاقتصادية	مستوى التنفيذ				
		دائما	غالبا	أحيانا	نادرا	أبدا
1	إعداد نموذج التكلفة الذي يربط الموارد مع أهداف البرنامج لضمان مطابقة أولويات المشروع مع الموارد					
2	تقييم احتياجات المجتمع					
3	التحول من تحليل التكلفة على المدى القصير وعائد الاستثمار إلى المكاسب طويلة الأجل من العائد التشغيلي					
4	دراسة تأثير المشروع على الاقتصاد المحلي، مثل العمالة المحلية واستهلاك المواد المحلية					
5	دراسة التأثير على القيمة السياحية للموقع					
6	رسم الأهداف الاقتصادية والبيئية على أساس تحليل التكلفة والفوائد المرجوة					
	عوامل الاستدامة الاجتماعية					
1	تقييم التأثير على ثقافة المجتمع					
2	مشاركة أصحاب المصلحة الخارجيين الرئيسيين وممثلين عن المجتمع، وضمان قبول المجتمع المحيط للمشروع					
3	مشاركة ممثلين عن التخصصات المختلفة ضمن فريق المشروع					
4	مراعاة تحسين قدرة البنية التحتية المحلية					
5	رفع مستوى الرفاهية وتوفير وسائل الراحة المجتمعية.					
6	اختيار موقع المشروع بناءً على مشاركة أصحاب المصلحة بما في ذلك المجتمع المحلي					
	عوامل الاستدامة البيئية					
1	تضمين أهداف بيئية من المشروع					
2	دراسة التأثير على الأيكولوجية البيئية لموقع المشروع					
3	دراسة المخاطر والفوائد البيئية المرتبطة بالمشروع					
4	دراسة تلوث الهواء والماء والضوضاء المحتمل أثناء تنفيذ المشروع واثناء مرحلة التشغيل.					
5	استشارة مختص حاصل على شهادة LEED					

ثانيا: فيما يتعلق بممارسات ادارة المشاريع الانشائية في مؤسستكم، يرجى الاشارة إلى مستوى تنفيذ كل من ممارسات الاستدامة المذكورة ضمن مرحلة التصميم.

ملاحظة: ضع اشارة ✓ في مربع الخيار المناسب.

	عوامل الاستدامة الاقتصادية	مستوى التنفيذ				
		دائما	غالبا	أحيانا	نادرا	أبدا
1	النظر في توفر الموارد اللازمة (المواد والآلات، وما إلى ذلك).					
2	اختيار المواد المعمرة والقابلة لإعادة الاستخدام والقابلة لإعادة التدوير.					
3	تقديرات واقعية للتكلفة والوقت					
4	الامتثال للمتطلبات القانونية					
5	الأبعاد القياسية في مواصفات التصميم					
	عوامل الاستدامة الاجتماعية					
1	تصميم بروتوكولات فعالة للصحة والسلامة					
2	التواصل مع جميع أصحاب المصلحة ومشاركتهم.					
3	التصميم لحالات الطوارئ، مثل الزلازل والحرائق والفيضانات الخ					
4	الحصول على التغذية الراجعة من الدوائر الحكومية الازمة والهيئات المحلية للتأكد من الامتثال للمتطلبات التنظيمية					
	عوامل الاستدامة البيئية					
1	الأخذ بعين الاعتبار الأثر البيئي للمواد المختارة					
2	استخدام العناصر القياسية لتحسين قدرة البناء وتقليل انتاج النفايات.					
3	النظر في المتطلبات البيئية في تصميم المشروع					

ثالثا: فيما يتعلق بممارسات ادارة المشاريع الانشائية في مؤسستكم، يرجى الاشارة إلى مستوى تنفيذ كل من ممارسات الاستدامة المذكورة ضمن مرحلة التعاقد.

ملاحظة: ضع اشارة ✓ في مربع الخيار المناسب.

	عوامل الاستدامة الاقتصادية	مستوى التنفيذ				
		دائما	غالبا	أحيانا	نادرا	أبدا
	شمولية الوثائق التعاقدية					
	الامتثال لقانون المشتريات.					
	نزاهة وشفافية إجراءات الشراء					
	تضمين الحوافز والمكافآت لتنفيذ ممارسات الاستدامة في العقود					
	عوامل الاستدامة الاجتماعية					
	التدقيق ما قبل وبعد المناقصة					
	منع الرشوة والفساد					
	المنافسة العادلة					
	عوامل الاستدامة البيئية					
	معايير الاختيار تجاه المقاولين، والتحقيق في مستوى وعيهم بمبادئ الاستدامة وسجلاتهم السابقة لتنفيذ المشاريع المستدامة.					
	أن تتضمن العقود أحكامًا محددة لمتطلبات شهادة LEED واتفاقيات لإعادة المواد غير المستخدمة إلى البائعين.					
	كمية المطبوعات الورقية المستخدمة					

رابعا: فيما يتعلق بممارسات ادارة المشاريع الانشائية في مؤسستكم، يرجى الاشارة إلى مستوى تنفيذ كل من ممارسات الاستدامة المذكورة ضمن مرحلة التنفيذ.

ملاحظة: ضع اشارة ✓ في مربع الخيار المناسب.

	عوامل الاستدامة الاقتصادية	مستوى التنفيذ				
		دائما	غالبا	أحيانا	نادرا	أبدا
1	الامتثال للمواصفات المطلوبة ومستوى الجودة.					
2	توظيف عمالة بجودة عالية					
3	الاستخدام الأمثل للموارد وإعادة استخدام القوالب والهياكل وما إلى ذلك					
4	استخدام أحدث تقنيات البناء وأساليب تنفيذ الأعمال.					
5	فحص وصيانة معدات البناء.					
6	التأمين على موقع البناء، القوى العاملة، والمعدات.					
	عوامل الاستدامة الاجتماعية					
1	خلق علاقات بناءة والتواصل المستمر بين أصحاب المصلحة في المشروع					
2	اختيار أعضاء فريق إدارة المشروع على أساس الكفاءة والشفافية					
3	التثقيف لفريق إدارة المشروع بخصوص متطلبات الاستدامة.					
4	الحوافز والمكافآت لفريق إدارة المشروع					
5	الصحة والسلامة في العمل					
6	مشاركة جميع الأطراف في مراقبة المشروع واتخاذ القرارات					
7	تعزيز الانسجام والوئام بين القوى العاملة المتنوعة في المشروع					
	عوامل الاستدامة البيئية					
1	مقدار استهلاك المياه وإعادة استخدامها.					
2	مدى استهلاك الطاقة واستخدام مصادر الطاقة المتجددة					
3	إدارة المواد الخطرة (العرض والاستخدام والتخلص)					
4	النظر في التأثير على حركة المواصلات (مدى الانسداد)					
5	التحكم في الضوضاء والاهتزاز					
6	إدارة نفايات البناء (طرق إعادة التدوير وإعادة الاستخدام والتخلص)					
7	الامتثال لقوانين وأنظمة حماية البيئة					
8	كمية الأعمال الورقية المستخدمة					
9	إشراك مراقب بيئي في فريق إدارة المشروع					

الجزء الثالث: الدوافع والعوائق التي تحول إلى تنفيذ وعدم تنفيذ الإدارة المستدامة للمشاريع الانشائية في الضفة الغربية.

- يرجى الإشارة إلى مستوى موافقتك على البيانات التالية.
- استخدم ✓ لتحديد الاختيار المناسب

	العوائق التي تحول دون تنفيذ الإدارة المستدامة للمشاريع الانشائية	موافق بشدة	موافق	لا أوافق ولا اعارض	أعارض	أعارض بشدة
1	نقص المعرفة والتدريب حول مفهوم الاستدامة					
2	عدم وجود جوانب قانونية تتعلق بالاستدامة في إدارة البناء					
3	الميل إلى استخدام أساليب التصميم والبناء التقليدية					
4	نقص المعلومات عن المشاكل التي تواجه الادارة المستدامة للمشاريع الانشائية وحلولها					
5	عدم اهتمام أصحاب المصلحة بقضايا الاستدامة "الاستدامة ليست أولوية"					
6	قد تزيد الاستدامة في تكلفة البناء على المدى القصير، وفترات السداد الطويلة					

	الدوافع لتنفيذ الإدارة المستدامة للمشاريع الانشائية	موافق بشدة	موافق	لا أوافق ولا اعارض	أعارض	أعارض بشدة
1	حوافز تخفيض الضرائب المتعلقة بجهود الاستثمار في ممارسات الاستدامة					
2	الحفاظ على الطاقة والموارد المتاحة					
3	اللوائح والسياسات الحكومية					
4	صورة وسمعة الشركة					
5	رضا المجتمع المحلي					
6	الحد من النفايات					
7	تحقيق فوائد بيئية					
8	تحسين استخدام المياه					
9	الحد من التعديلات واعادة تنفيذ الأعمال					

الجزء الرابع: أداء الادارة المستدامة للمشاريع الانشائية

- يرجى الإشارة إلى مستوى موافقتك على البيانات التالية.
- استخدم ✓ لتحديد الاختيار المناسب.

	العوامل المؤثرة على أداء الادارة المستدامة للمشاريع الانشائية	موافق بشدة	موافق	لا أوافق ولا اعارض	أعارض	أعارض بشدة
1	تطوير البرامج والآليات التي تدعم تبني متطلبات الاستدامة في ادارة المشاريع الانشائية					
2	برامج زيادة الوعي للسياسيين وصناع القرار الاستراتيجيين بما يخص معايير الاستدامة في ادارى المشاريع الانشائية					
3	وعي ودعم الادارة العليا للمؤسسة/ الشركة لتبنى معايير الاستدامة في ادارة المشاريع الانشائية					
4	دمج قضايا الاستدامة في تقرير المؤسسة/ الشركة					
5	اختيار مدير المشروع الذين هم على دراية بمبادئ الادارة المستدامة للمشاريع الانشائية					
6	تطوير واستخدام الآليات والأدوات المناسبة لمراقبة وتقييم الأداء بما يخص تنفيذ معايير الاستدامة في ادارة المشاريع الانشائية					
7	الموازنة بين احتياجات الإنسان مع القدرة الاستيعابية للبيئة الطبيعية					
8	تخصيص جزء من رأس المال أو الميزانية المرصودة للمشروع للاستثمار في مبادرات تحقيق متطلبات الاستدامة					
9	مراجعة متطلبات الاستدامة مع كل مقاول من الباطن قبل بدء العمل					
10	عمل الجهات التنظيمية الحكومية كشريك في المشروع					

الجزء الخامس: ما الذي تود إضافته بما يتعلق بتنفيذ وتبني معايير ومتطلبات الاستدامة في إدارة مشاريع البناء في الضفة الغربية؟

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Appendix (H)

Table (H1): Cross loading results.

	Barr	Driv	SCPMP	Ec-In	S-In	En-In	Ec-D	S-D	En-D	Ec-T	S-T	En-T	Ec-Im	S-Im	En-Im
Ec.In1	0.232	0.241	0.105	**0.592**	0.428	0.301	0.221	0.311	0.406	0.415	0.270	0.322	0.428	0.301	0.222
Ec.In2	0.152	0.382	0.224	**0.644**	0.421	0.065	0.331	0.044	0.095	0.465	0.035	0.303	0.332	0.097	0.441
Ec.In3	0.247	0.114	0.322	**0.745**	0.160	0.240	0.057	0.082	0.162	0.315	0.241	0.072	0.406	0.150	0.270
Ec.In4	0.314	0.233	0.150	**0.689**	0.088	0.195	0.140	0.047	0.335	0.124	0.188	0.124	0.054	0.051	0.021
Ec.In5	0.201	0.314	0.114	**0.822**	0.062	0.150	0.540	0.092	0.208	0.338	0.445	0.338	0.107	0.085	0.155
Ec.In6	0.044	0.150	0.642	**0.607**	0.366	0.329	0.336	0.524	0.035	0.524	0.340	0.524	0.401	0.104	0.047
S.In1	0.307	0.420	0.221	0.335	**0.742**	0.155	0.251	0442	0.241	0.124	0.316	0.124	0.112	0.292	0.224
S.In2	0.249	0.112	0.365	0.072	**0.689**	0.472	0.150	0.562	0.422	0.465	0.366	0.329	0.329	0.218	0.105
S.In3	0148	0.042	0.025	0.204	**0.703**	0.361	0.472	0.181	0.417	0.623	0.037	0.117	0.340	0.360	0.022
S.In4	0.354	0.095	0.330	0.154	**0.588**	0.145	0.281	0.290	0.302	0.155	0.256	0.346	0.158	0.112	0.079
S.In5	0.178	0.116	0.056	0.158	**0.833**	0.345	0218	0.305	0.32	0.047	0.251	0.345	0.227	0.422	0.199
S.In6	0.308	0.293	0.085	0.335	**0.712**	0.134	0.321	0.184	0.117	0.202	0.142	0.134	0.505	0.308	0.203
En.In1	0.297	0.335	0.092	0.254	0.518	**0.862**	0.116	0.421	0.150	0.097	0.118	0.461	0.044	0.117	0.420
En.In2	0.095	0.098	0.420	0.266	0.522	**0.726**	0.624	0.115	0.502	0.307	0.322	0.215	0.501	0.142	0.441
En.In3	0.078	0.362	0.412	0.321	0.409	**0.592**	0.384	0.492	0.421	0.402	0.401	0.157	0.162	0.338	0.247
En.In4	0.442	0.299	0.044	0.117	0.420	**0.817**	0.255	0.422	0.115	0.422	0.101	0.465	0.366	0.329	0.336
En.In5	0.201	0.542	0.501	0.142	0.441	**0.833**	0.408	0.415	0.434	0.415	0.177	0.335	0.250	0.155	0.251
Ec.D1	0.097	0.180	0.162	0.338	0.247	0.224	**0.714**	0.465	0.366	0.465	0.335	0.252	0.308	0.203	0.152
Ec.D2	0.265	0.363	0.503	0.216	0.165	0.218	**0.763**	0.224	0.152	0.065	0.251	0.375	0.045	0.254	0.245
Ec.D3	0.145	0.180	0.225	0.203	0.118	0.099	**0.698**	0521	0.114	0.240	0.336	0.245	0.447	0.376	0.782
Ec.D4	0.225	0.502	0.145	0142	0.308	0.209	**0.711**	0.242	0.228	0.195	0.142	0.427	0.368	0.208	0.648
Ec.D5	0.106	0.088	0.146	0.265	0.085	0.045	**0.588**	0.317	0.364	0.150	0.385	0.465	0.366	0.329	0.336
S.D1	0.147	0.222	0.322	0.115	0.221	0.082	0.622	**0.811**	0.107	0.230	0.207	0.335	0.250	0.155	0.251
S.D2	0.495	0.192	0.408	0.214	0.085	0.445	0.335	**0.795**	0.309	0.045	0.211	0.408	0.428	0.301	0.222
S.D3	0.661	0.364	0.115	0.104	0.151	0.341	0.127	**0.682**	0.270	0.322	0.037	0.117	0.105	0.314	0.451
S.D4	0.207	0.425	0.362	0.310	0.117	0.054	0.340	**0.599**	0.117	0.420	0.256	0.346	0.472	0.150	0.562

En.D 1	0.148	0.129	0.211	0.211	0.362	0.107	0.160	0.501	**0.722**	0.441	0.112	0.245	0.361	0.472	0.181
En.D 2	0.193	0.216	0.404	0.433	0.252	0.062	0.055	0.355	**0.655**	0.188	0.528	0.085	0.145	0.281	0.290
En.D 3	0.350	0.344	0.552	0.035	0.303	0.332	0.097	0.051	**0.801**	0.445	0.401	0.104	0.428	0.301	0.222
En.D 4	0.308	0.033	0.224	0.241	0.072	0.406	0.150	0.260	**0.835**	0.340	0.465	0.366	0.329	0.336	0.524
Ec.T 1	0.116	0.434	0.472	0.104	0.047	0.155	0.465	0.366	0.029	**0.644**	0.107	0.428	0.604	0.401	0.202
Ec.T 2	0.072	0.406	0.150	0.401	0.202	0.047	0.335	0.250	0.155	**0.765**	0.522	0.521	0.222	0.083	0.097
Ec.T 3	0.329	0.112	0.245	0.083	0.097	0.202	0.252	0.308	0.203	**0.710**	0.028	0.035	0.528	0.085	0.155
Ec.T 4	0.155	0.329	0.149	0.528	0.085	0.155	0.421	0.402	0.448	**0.822**	0.195	0.241	0.401	0.104	0.047
S.T 1	0.044	0.211	0.342	0.422	0.087	0.427	0.260	0.328	0.292	0.224	**0.784**	0.250	0.155	0.251	0442
S.T 2	0.625	0.305	0.081	0.415	0.364	0.569	0.528	0.085	0.218	0.105	**0.694**	0.308	0.203	0.152	0.254
S.T 3	0.142	0.140	0.093	0.465	0.245	0.636	0.401	0.106	0.360	0.022	**0.608**	0.208	0.072	0.406	0.150
En.T 1	0.402	0.227	0.150	0.335	0.635	0.731	0.604	0.401	0.112	0.079	0.155	**0.776**	0.422	0.115	0.254
En.T 2	0.088	0.167	0.441	0.422	0.428	0.301	0.222	0.083	0.422	0.199	0.047	**0.841**	0.415	0.434	0.376
En.T 3	0.115	0.350	0.315	0.329	0.375	0.168	0.371	0.150	0.325	0.141	0.202	**0.566**	0.465	0.366	0.208
En.T 4	0.511	0.177	0.131	0.155	0.105	0.044	0.117	0.420	0.115	0.151	0.097	**0.578**	0.335	0.250	0.467
Ec.I m 1	0.202	0.281	0.240	0.301	0.045	0.501	0.142	0.441	0.434	0.308	0.340	0.177	**0.735**	0.421	0.402
Ec.I m 2	0.335	0.405	0.333	0.072	0.406	0.162	0.338	0.247	0.254	0.245	0.316	0.325	**0.598**	0.422	0.065
Ec.I m 3	0.258	0.208	0.405	0.044	0.375	0.442	0.299	0.044	0.332	0.097	0.124	0.115	**0.745**	0104	0.240
Ec.I m 4	0.037	0.117	0.336	0.067	0.245	0.201	0.542	0.501	0.428	0.301	0.302	0.434	**0.699**	0.335	0.195
Ec.I m 5	0.256	0.346	0.205	0.047	0.427	0.097	0.180	0.162	0.095	0.330	0.224	0.254	**0.684**	0.408	0.150
Ec.I m 6	0.112	0.245	0.245	0.421	0.402	0.265	0.363	0.503	0.116	0.056	0.105	0.115	**0.708**	0.037	0.117
S.Im 1	0.329	0.149	0.152	0.042	0.025	0.145	0.180	0.225	0.293	0.085	0.105	0.292	0.224	**0.617**	0.346
S.Im 2	0.340	0.115	0.252	0.095	0.330	0.225	0.502	0.145	0.335	0.092	0.045	0.218	0.105	**0.717**	0.518
S.Im 3	0.158	0.434	0.030	0.116	0.056	0.106	0.088	0.146	0.465	0.366	0.329	0.360	0.022	**0.811**	0.522
S.Im 4	0.227	0.245	0.402	0.293	0.085	0.147	0.222	0.322	0.335	0.250	0.155	0.112	0.079	**0.688**	0.409
S.Im 5	0.505	0.521	0.346	0.311	0.432	0.424	0.157	0.465	0.366	0.329	0.336	0.524	0.230	**0.765**	0.420
S.Im 6	0.162	0.345	0.224	0.215	0.325	0.141	0.422	0.335	0.250	0.155	0.251	0442	0.045	**0.744**	0.441
S.Im 7	0.065	0.134	0.407	0.422	0.105	0.051	0104	0.252	0.308	0.203	0.152	0.254	0.177	**0.677**	0.247
En.I m 1	0.240	0.461	0.346	0.415	0.434	0.308	0.335	0.412	0.415	0.434	0.115	0.422	0.101	0.216	**0.711**
En.I	0.1	0.2	0.28	0.0	0.2	0.2	0.4	0.3	0.4	0.3	0.4	0.4	0.1	0.2	**0.6**

m 2	95	15	0	45	54	45	08	10	65	66	34	15	77	03	**33**
En.Im 3	0.150	0.102	0.510	0.447	0.376	0.782	0.162	0.501	0.142	0.441	0.366	0.465	0.335	0142	**0.747**
En.Im 4	0.384	0.350	0.427	0.368	0.208	0.648	0.181	0.162	0.338	0.247	0.035	0.303	0.332	0.097	**0.699**
En.Im 5	0.614	0.224	0.301	0.430	0.525	0.212	0.340	0.503	0.216	0.165	0.241	0.072	0.406	0.150	**0.734**
En.Im 6	0.425	0.504	0.262	0.528	0.085	0.155	0.292	0.225	0.203	0.118	0.241	0.623	0.042	0.025	**0.816**
En.Im 7	0.085	0.345	0.447	0.401	0.104	0.047	0.105	0.145	0142	0.308	0.117	0.155	0.095	0.330	**0.668**
En.Im 8	0.078	0.244	0.166	0.072	0.406	0.150	0.045	0.084	0.428	0.301	0.222	0.047	0.116	0.056	**0.714**
En.Im 9	0.124	0.188	0.501	0.195	0.042	0.025	0.204	0.044	0.117	0.420	0.377	0.202	0.293	0.085	**0.802**
SCPMP 1	0.338	0.445	**0.688**	0.150	0.095	0.330	0.154	0.501	0.142	0.441	0.054	0.097	0.325	0.141	0.422
SCPMP 2	0.524	0.340	**0.702**	0.329	0.116	0.056	0.158	0.162	0.338	0.247	0.107	0.307	0.115	0.151	0104
SCPMP 3	0.124	0.316	**0.748**	0.155	0.293	0.172	0.335	0.280	0.087	0.427	0.260	0.328	0.434	0.308	0.335
SCPMP 4	0.165	0.124	**0.814**	0.569	0.528	0.085	0.155	0.623	0.364	0.569	0.528	0.085	0.254	0.245	0.408
SCPMP 5	0.472	0.302	**0.672**	0.636	0.401	0.104	0.047	0.155	0.245	0.636	0.401	0.104	0.528	0.085	0.124
SCPMP 6	0.292	0.224	**0.717**	0.731	0.604	0.401	0.202	0.047	0.635	0.731	0.604	0.401	0.401	0.104	0.338
SCPMP 7	0.218	0.105	**0.841**	0.301	0.222	0.083	0.097	0.202	0.428	0.301	0.222	0.083	0.270	0.322	0.524
SCPMP 8	0.360	0.022	**0.920**	0.569	0.528	0.085	0.155	0.097	0.375	0.168	0.371	0.150	0.051	0.021	0.124
SCPMP 9	0.112	0.079	**0.866**	0.636	0.401	0.104	0.047	0.307	0.152	0.421	0.402	0.115	0.151	0104	0.124
SCPMP 10	0.422	0.199	**0.658**	0.325	0.141	0.422	0.157	0.428	0.301	0.222	0.115	0.252	0.095	0.115	0.165
Driv 1	0.224	**0.845**	0.266	0.115	0.151	0104	0.177	0.131	0.415	0.434	0.434	0.030	0.116	0.434	0.472
Driv 2	0.336	**0.801**	0.502	0.434	0.308	0.335	0.401	0.375	0.465	0.366	0.332	0.097	0.072	0.406	0.150
Driv 3	0.114	**0.784**	0.511	0.047	0.107	0.428	0.108	0.245	0.308	0.203	0.465	0.366	0.329	0.112	0.245
Driv 4	0.228	**0.799**	0.204	0.202	0.522	0.521	0.553	0.427	0.254	0.518	0.335	0.250	0.155	0.329	0.149
Driv 5	0.364	**0.717**	0.303	0.115	0.065	0.045	0.254	0.245	0.266	0.522	0.230	0.202	0.281	0.340	0.115
Driv 6	0.107	**0.892**	0.442	0.066	0.240	0.447	0.376	0.782	0.321	0.409	0.045	0.335	0.405	0.158	0.434
Driv 7	0.309	**0.704**	0.155	0.332	0.195	0.368	0.208	0.648	0.117	0.420	0.105	0.258	0.208	0.227	0.245
Driv 8	0.114	**0.862**	0.225	0.241	0.150	0.205	0.037	0.117	0.142	0.441	0.045	0.037	0.117	0.505	0.521
Driv 9	0.485	**0.844**	0.344	0.115	0.115	0.272	0.256	0.346	0.338	0.247	0.072	0.406	0.150	0.162	0.345
Barr 1	**0.785**	0.422	0.115	0.164	0.434	0114	0.042	0.025	0.204	0.044	0.117	0.420	0.366	0.065	0.134
Barr 2	**0.722**	0.415	0.434	0.177	0.426	0.335	0.095	0.330	0.154	0.501	0.142	0.441	0.250	0.240	0.461

Barr 3	**0.821**	0.465	0.366	0.029	0.336	0.524	0.035	0.303	0.332	0.097	0.124	0.188	0.308	0.195	0.215
Barr 4	**0.822**	0.335	0.250	0.155	0.251	0442	0.241	0.072	0.406	0.157	0.338	0.445	0.405	0.366	0.329
Barr 5	**0.774**	0.252	0.308	0.203	0.152	0.037	0.117	0.325	0.141	0.422	0.524	0.340	0.335	0.250	0.155
Barr 6	**0.819**	0.421	0.402	0.448	0.365	0.256	0.346	0.115	0.151	0104	0.124	0.316	0.252	0.308	0.203

Table (H2): Fornell-Larckers criterion test results.

	Barr	Driv	SCPMP	Ec-In	S-In	En-In	Ec-D	S-D	En-D	Ec-T	S-T	En-T	Ec-Im	S-Im	En-Im
Barr	**0.875**														
Driv	0.754	**0.798**													
SCPMP	0.230	0.654	**0.837**												
Ec-In	0.045	0.254	0.245	**0.855**											
S-In	0.447	0.376	0.782	0.546	**0.748**										
En-In	0.368	0.208	0.648	0.678	0.531	**0.805**									
Ec-D	0.775	0.467	0.134	0.750	0.209	0.214	**0.968**								
S-D	0.542	0.145	0.645	0.375	0.641	0.607	0.025	**0.885**							
En-D	0.207	0.345	0.458	0.245	0.051	0.021	0.451	0.387	**0.709**						
Ec-T	0.105	0.143	0.087	0.427	0.260	0.328	0.623	0.124	0.544	**0.841**					
S-T	0.045	0.642	0.364	0.569	0.528	0.085	0.155	0.054	0.093	0.407	**0.699**				
En-T	0.315	0.145	0.245	0.636	0.401	0.104	0.047	0.107	0.428	0.108	0.466	**0.677**			
Ec-Im	0.267	0.523	0.635	0.731	0.604	0.401	0.202	0.522	0.521	0.553	0.195	0.173	**0.681**		
S-Im	0.364	0.736	0.428	0.301	0.222	0.083	0.097	0.028	0.035	0.303	0.332	0.097	0.441	**0.720**	
En-Im	0.259	0.076	0.375	0.168	0.371	-0.150	0.307	0.195	0.241	0.072	0.406	0.150	0.270	0.322	**0.86**

جامعة النجاح الوطنية

كلية الدراسات العليا

الممارسات المستدامة في إدارة المشاريع الإنشائية في الضفة الغربية/ فلسطين

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قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الادارة الهندسية، بكلية الدارسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

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الملخص

تهدف التنمية المستدامة (SD) إلى تلبية احتياجات الأجيال الحالية دون التأثير على قدرة الأجيال القادمة في تلبية احتياجاتهم الخاصة. منذ العقود الماضية، تم إنشاء العديد من المبادرات لتشجيع قطاع الانشاءات على دعم أجندة التنمية المستدامة. تهدف هذه الدراسة إلى بحث الممارسات التي تؤثر على الإدارة المستدامة للمشاريع الإنشائية (CPM) في الضفة الغربية. تم جمع البيانات باستخدام منهجية مختلطة (Mixed Methodology)، حيث تم جمع البيانات الكمية من خلال 73 استبيانًا، وتم جمع البيانات النوعية من خلال 11 مقابلة (Semi-Structured) مع خبراء من مجال إدارة المشاريع الانشائية في الضفة الغربية. تم تحليل البيانات باستخدام منهجية PLS-SEM.

كشفت نتائج تحليل البيانات عن 24 من أهم الممارسات المستدامة التي يتم تنفيذها دائمًا من قبل المهندسين في كل مرحلة من مراحل مشاريع البناء في الضفة الغربية، والتي تم تصنيفها على النحو التالي: ممارسة مستدامة واحدة مصنف تحت مرحلة البداية، ثماني ممارسات مستدامة تحت مرحلة التصميم، سبع ممارسات مستدامة تحت مرحلة المناقصة، وثماني ممارسات مستدامة في مرحلة التنفيذ. الممارسة الأكثر شيوعًا التي يتم أخذها بعين الاعتبار خلال مرحلة بدء المشاريع الانشائية في الضفة الغربية هي تضمين ممثلين متنوعين من وظائف فريق المشروع (85.6٪)، والممارسات الأكثر شيوعًا التي يتم أخذها خلال مرحلة التصميم هي: استخدام الأبعاد القياسية في مواصفات التصميم (90.6٪)، والالتزام بالمتطلبات القانونية (90.3٪).

في مرحلة تقديم العطاءات، الممارسات الأكثر شيوعًا هي: منع الرشوة والفساد (94.7٪)، إجراءات عمليات الشراء الشفافة (94.7٪)، وثائق العقود والمواصفات الشاملة (92.2). وأخيرًا، إن أكثر الممارسات المستدامة التي تم اتخاذها خلال مرحلة التنفيذ هي: الالتزام بالمواصفات المطلوبة ومستوى الجودة (89٪)، والتأمين على موقع البناء والقوى العاملة والمعدات (89٪). أظهر اختبار Path coefficient أن الممارسات المستدامة في مرحلة البداية كان لها أكبر تأثير إيجابي على أداء الإدارة المستدامة للمشاريع الإنشائية (SCPMP)، حيث كانت $\beta = 0.308$.

كما أوضحت الدراسة أن العائق الرئيسي أمام تطبيق الادارة المستدامة للمشاريع الانشائية في فلسطين هو عدم اهتمام أصحاب المصلحة بقضايا الاستدامة (87.8٪)، لذلك أوصت بزيادة الوعي بالاستدامة في قطاع الإنشاءات الفلسطيني، وخاصة على مستوى صانعي القرار. أيضا هذه هي الدراسة الأولى التي ترسم خارطة الطريق للمؤسسات العاملة في قطاع الإنشاءات في الضفة الغربية من خلال توفير إطار عمل (Framework) لتطبيق الادارة المستدامة للمشاريع الانشائية في فلسطين.